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SRS–61

Forest Resources of Mississippi, 1994

James F. Rosson, Jr.

Cover photograph by Dr. James F. Rosson, Jr.—One of the important findings of the seventh forest survey of Mississippi was an increase in the States's timberland by 1.6 million acres. Most of this increase came from the reversion of agriculture land to forest land as shown in the photograph. A couple of years without mowing brings on the invasion of woody species from nearby seed sources. Shown is green ash (*Fraxinus pennsylvanica* Marsh.) (background) and loblolly pine (*Pinus taeda* L.) (foreground) invading a low-lying field in Webster County.

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Southern Research Station
P. O. Box 2680
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Forest Resources of Mississippi, 1994

James F. Rosson, Jr., Research Forester

Forest Inventory and Analysis
Starkville, Mississippi

Foreword

This resource bulletin describes the principal findings of the seventh inventory of Mississippi's forest resources. Data on the extent, condition, and classification of forest land and associated timber volumes, growth, removals, and mortality are described and interpreted. Whereas data on nontimber commodities associated with forests were also collected, evaluations of these data are not included in this bulletin.

At the time of the Mississippi survey, periodic surveys were mandated by the Forest and Rangeland Renewable Resources Planning Act of 1974, the National Forest Management Act of 1976, and the Forest and Rangeland Renewable Resources Research Act of 1978. These surveys are part of a continuing, nationwide undertaking by the regional experiment stations of the U.S. Department of Agriculture Forest Service. Inventories of the 13 Southern States (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia) and the Commonwealth of Puerto Rico are conducted by the Southern Research Station, Forest Inventory and Analysis Research Work Unit (FIA) operating from its headquarters in Asheville, NC, and from an office in Starkville, MS. The primary objective of these periodic appraisals is to develop and maintain the resource information needed to formulate sound forest policies and programs. More information is available about Forest Service resource inventories (U.S. Department of Agriculture, Forest Service 1992).

Tabular data included in FIA reports are designed to provide a comprehensive array of forest resource statistics, but additional data can be obtained for those who require more specialized information. The forest resource data for Southern States can be accessed directly via the Internet at: www.srsfia.usfs.msstate.edu. Data in a format common to the three FIA units in the Eastern United States (Eastwide Data Base) are also available (Hansen and others 1992). These data may be obtained at the Internet site referenced above.

Information concerning any aspect of this survey may be obtained from:

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James H. Perdue
Project Leader

Acknowledgments

The Southern Research Station gratefully acknowledges the cooperation and assistance provided to field crews in the collection of field data by the Mississippi Forestry Commission and Georgia-Pacific Corporation. Appreciation is also expressed for the cooperation of other public agencies and private landowners in providing access to sample plots.

The following members of the FIA staff completed field measurements in the 1994 survey of Mississippi:

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[a] All tables in this report are available in Microsoft® Excel workbook files. Upon request, these files will be supplied on 3½-inch diskettes.

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Highlights from the Seventh Inventory of Mississippi

Important findings of the seventh forest survey of Mississippi are presented below. Comparisons, unless otherwise noted, are based on estimates dated January 1, 1987, and January 1, 1994.

- Timberland area increased by 1.6 million acres. A total of 2.0 million nonforest acres reverted to timberland and 374,500 acres of timberland diverted to a nonforest land use.

- The oak-hickory forest-type group remained the predominant type in Mississippi. There were 5.8 million acres in this type. Ranked second was the loblolly-shortleaf pine forest-type group with 4.9 million acres. The latter type increased by 946,200 acres since 1987 and may overtake the oak-hickory forest-type group by the next Mississippi survey.

- The predominant stand-size class was sawtimber but the sapling-seedling class was close in area, 7.7 million acres versus 7.0 million acres, respectively.

- Softwood live-tree volume declined by 111.2 million cubic feet. The 1994 inventory was 9,362.5 million cubic feet.

- Hardwood live-tree volume increased by 398.7 million cubic feet. The 1994 inventory was 13,286.7 million cubic feet.

- Softwood live-tree net growth was 638.0 million cubic feet per year, a 31-percent increase over the 485.6 million cubic feet per year reported in 1987. Removals increased to 715.8 million cubic feet per year from 485.6 million cubic feet per year. Net change in the inventory was minus 77.8 million cubic feet per year.

- Hardwood live-tree net growth decreased 8 percent, from 501.2 million cubic feet per year in 1987 to 462.8 million cubic feet per year in 1994. Removals almost doubled, increasing from 269.4 to 495.3 million cubic feet per year. The net change to the inventory was minus 32.6 million cubic feet per year.

- Plantation area was 4.3 million acres, an increase of 1.1 million acres.

- Volume of softwoods in plantations increased from 1,845.2 million cubic feet in 1987 to 2,367.5 million cubic feet in 1994.

- Since 1987, Mississippi had 5.5 million acres undergo some form of commercial harvest activity.

- Since 1987, Mississippi had 1.6 million acres of timberland undergo some form of intermediate stand treatment (thinning or stand improvement).

Introduction

This bulletin summarizes the findings of the seventh Mississippi forest survey. The survey is conducted periodically and is administered by the U.S. Department of Agriculture Forest Service. At the time this survey was implemented, administrative responsibility came under the Southern Forest Experiment Station, headquartered in New Orleans, LA; the field unit that carried out the survey is located in Starkville, MS. Since the conclusion of field work, the Southern Forest Experiment Station merged with the Southeastern Forest Experiment Station to become the Southern Research Station, which is headquartered in Asheville, NC. The following States are now under the administration of the Southern Research Station, FIA: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and the Commonwealth of Puerto Rico.

Mississippi was the first State in the South to be surveyed by the FIA; Georgia followed soon after. Field work for this first forest survey began in January 1931 and by January 1935, 11 Southern States had surveys underway (Southern Forest Survey Staff 1934a). Six forest surveys of Mississippi have been completed. The first survey resulted in several miscellaneous publications (Southern Forest Survey Staff 1934a, 1934b, 1935; Stover 1942; The Southern Forest Survey 1935, 1938). The remaining State analytical publications (surveys 2 through 6) had a single summary report for each survey: 1947 (U.S. Department of Agriculture, Forest Service 1949), 1957 (U.S. Department of Agriculture, Forest Service 1958), 1967 (Van Sickle and Van Hooser 1969), 1977 (Murphy 1978), and 1987 (Kelly and Sims 1989).

Mississippi is partitioned into five forest survey units (or regions): the Delta, the Central, the North, the South, and the Southwest (fig. 1). Unit boundaries were established after examination of data from the first survey conducted in the 1930's. Planners strived to establish boundaries that enclosed uniform forest type and physiographic conditions (Southern Forest Survey Staff 1934a). Although it may be argued that these political boundaries (which follow county lines) do not provide adequate information for some ecosystem attributes and analyses, they do follow, fairly closely, most major landscape demarcations, such as forest type. Over time, it became important not to move these boundaries in order to ensure strong trend analyses.

The survey documented in this bulletin began in December 1992 and was completed in August 1994. During this field work phase, 65,004 trees 5.0 inches diameter at breast height (d.b.h.) or larger were measured. Additionally, 42,241 trees at least 1.0 inch but less than 5.0 inches d.b.h. were measured. There were 3,185 timberland plots visited by field crews during the survey. The average elapsed time between surveys was 6.95 years (or 6 years and 11 months). This was derived by dividing the sum of the lengths of time between surveys for each plot by the total number of forested plots.

Tables and figures represent data for January 1, 1994, along with trends since the previous inventory. Comparisons, unless otherwise noted, are made between estimates for January 1, 1987, and January 1, 1994. The appendix describes survey methods and data reliability, defines terms, lists tree species found in the sample, and provides 22 standard tables.

Several publications about Mississippi's seventh forest survey already have been published: five survey unit reports (Faulkner and others 1993a, 1993b, 1994, 1995a, 1995b) and a county statistical report (Hartsell and London 1995).

Forest Area

In 1994, there were 30.0 million acres of land in Mississippi, based on the 1990 census (U.S. Department of Commerce, Bureau of the Census, 1991). This estimate was 204,200 acres less than the 1980 census area used in the 1987 survey. Two definition changes since the 1980 census impacted the 1990 total area and all land estimates. First, coastal and territorial water areas were added to the total area estimate. Total area (which includes all water) was 31.0 million acres. Second, there was a definition change for inland water. Formerly, bodies of water had to be greater than or equal to 40 acres to be classed as water and, thus, excluded from all land estimates. In the 1990 census, water bodies only had to be greater than or equal to 4.5 acres to be classed as water (U.S. Department of Commerce, Bureau of the Census, 1991). This effectively reduced the land-area estimate. The impact of these definition changes was that the inclusion of coastal and territorial areas increased the total area estimate by 476,295 acres. The water definition change decreased the all-land estimate, resulting in a net all-land difference between surveys of 204,200 acres. The overall effect of this is an increase in the size of area (plot) expansion factors in respective counties, somewhat clouding absolute comparisons between surveys. The coastal and territorial water definition impacted only the coastal counties. However, the water definition change impacted counties all across the State.

Figure 1—Forest survey units of Mississippi.

Timberland area in Mississippi was 18.6 million acres. Through survey history, the timberland base has fluctuated around the 16- to 17-million-acre level (table I). The survey in 1994 showed a large increase in timberland. Most of the timberland was in the Central, North, and South units, with 4.5, 4.9, and 4.7 million acres, respectively. Two units, Delta and South, had less timberland in 1994 than they did in the 1934 survey. The Delta unit declined from a high of 2.2 million acres in 1934 to a low of 1.4 million acres in 1987. Since 1987, timberland area in the Delta unit increased by 151,500 acres. The South unit declined from a high of 4.9 million acres in 1934 to a low of 4.3 million acres in 1977. Between 1977 and 1994, timberland increased to 4.7 million acres. The lowest timberland area recorded for all of

Table I—Timberland area by forest survey unit, Mississippi, 1934 to 1994

Forest survey unit	Survey year						
	1934	1948	1957	1967	1977	1987	1994
	Thousand acres						
Delta	2,245.3	2,043.2	1,917.1	1,493.8	1,476.6	1,392.1	1,543.6
Central	3,484.9	3,554.6	3,792.4	3,959.5	3,879.3	4,097.0	4,485.3
North	3,209.4	3,722.9	4,204.0	4,194.8	4,251.4	4,402.4	4,856.0
South	4,893.2	4,746.4	4,533.7	4,489.1	4,320.7	4,329.0	4,666.2
Southwest	2,417.1	2,465.4	2,746.7	2,754.7	2,756.8	2,766.0	3,036.2
All units	16,249.9	16,532.5	17,193.6	16,891.9	16,684.7	16,986.6	18,587.3

Numbers in rows and columns may not sum to totals due to rounding.

Mississippi was in the 1934 survey, 16.2 million acres. The highest timberland area recorded was in the 1994 survey with 18.6 million acres.

Although Mississippi showed a 1.6-million-acre increase in the timberland-area base since the 1987 survey, the change in timberland area is more complex than simply adding timberland area to the 1987 base. Table II shows the two types of change that can occur to land: it can change to forest if it is in a nonforest condition (an addition); or it can change to nonforest if it is in a forest condition (a diversion). Since 1987, 2.0 million acres have changed from a nonforest to a forest condition. Ninety percent of this area was from agriculture. Countering this were 374,500 acres of forest land that diverted to a nonforest condition. Forty-seven percent diverted to agriculture and 45 percent to urban. Most of the diversions were in the North and South units, 36 and 27 percent, respectively. The combination of the diversion and addition changes resulted in a net gain of 1.6 million acres of timberland for the 1994 survey.

With the large increase in timberland area, it was apparent that several counties had substantial increases in timberland area. Since 1987, 40 counties had timberland gains of 20,000 acres or more (fig. 2). In contrast, 42 counties had a change in timberland area of less than 20,000 acres. There were no counties in Mississippi that lost 20,000 acres or more of timberland.

With 62 percent of Mississippi's land area in timberland, many of the 82 counties had substantial areas of timberland coverage. Ten counties had more than 80 percent of their land area in timberland. Most of these counties were in the southern half of the State (fig. 3). Forty-one counties had 61

Table II—Changes in timberland by forest survey unit, Mississippi, 1987 to 1994

Forest survey unit	Total land	Timberland	Change	Additions			Diversions		
				Total	Agriculture	Other[a]	Total	Agriculture	Other[a]
	Thousand acres								
Delta	5,417.7	1,543.6	151.5	170.6	145.0	25.6	-19.1	-12.7	-6.4
Central	5,896.6	4,485.3	388.2	451.2	389.1	62.0	-62.9	-34.3	-28.6
North	8,249.7	4,856.0	453.5	587.9	544.4	43.5	-134.4	-61.1	-73.3
South	6,110.4	4,666.2	337.2	438.2	396.8	41.4	-101.0	-39.3	-61.7
Southwest	4,350.3	3,036.2	270.2	327.4	279.6	47.7	-57.2	-28.6	-28.6
All units	30,024.7	18,587.3	1,600.7	1,975.2	1,755.0	220.2	-374.5	-176.0	-198.6

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes urban, industrial, highway, water, rights-of-way, etc.

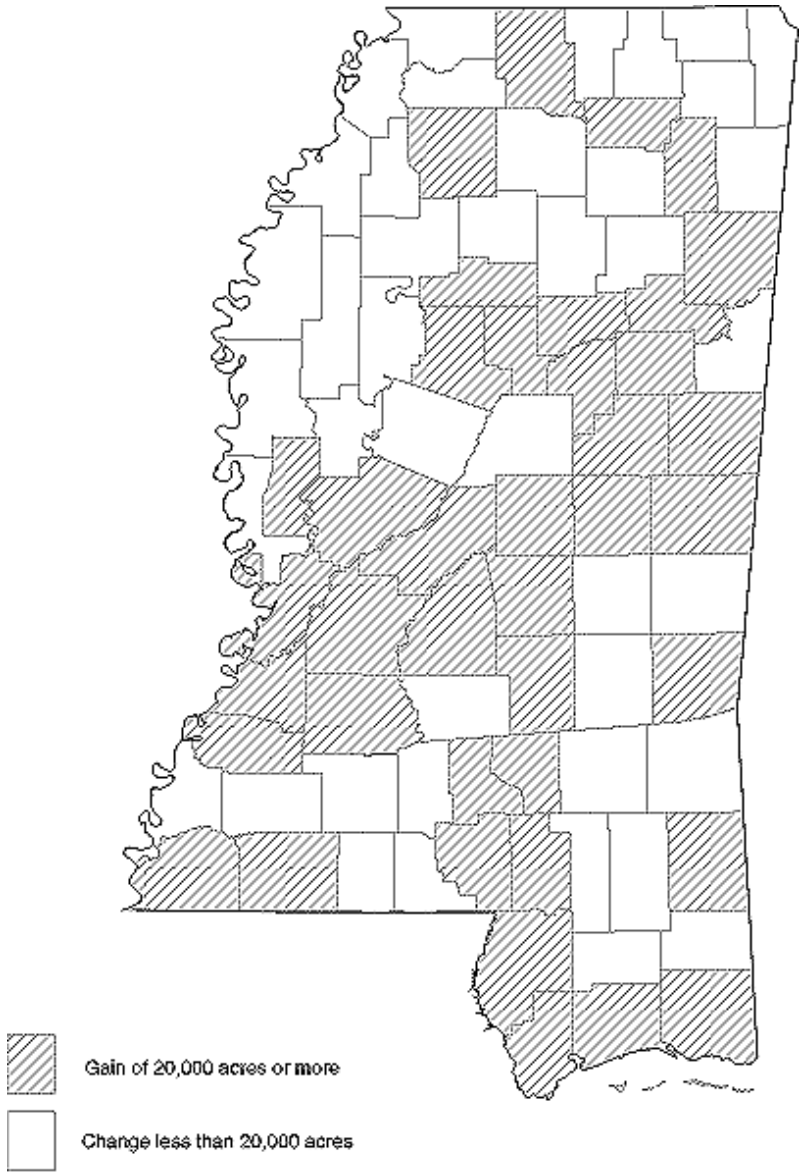

Figure 2—Mississippi counties with gains or losses in timberland, 1987 to 1994. There were no counties with losses of 20,000 acres or more.

to 80 percent of land area in timberland, while 18 counties had 41 to 60 percent in timberland. There were only five counties with 21 to 40 percent in timberland and eight counties with less than 20 percent in timberland. The latter counties were all in the Delta unit (fig. 3).

Forest Ownership

Mississippi continued to be a State dominated by nonindustrial private forest (NIPF) ownership. In the 1994 survey, 13.4 million acres were in NIPF ownership, 72 percent of all timberland in the State (table III). Forest industry followed, with 3.2 million acres of timberland (17 percent of all State

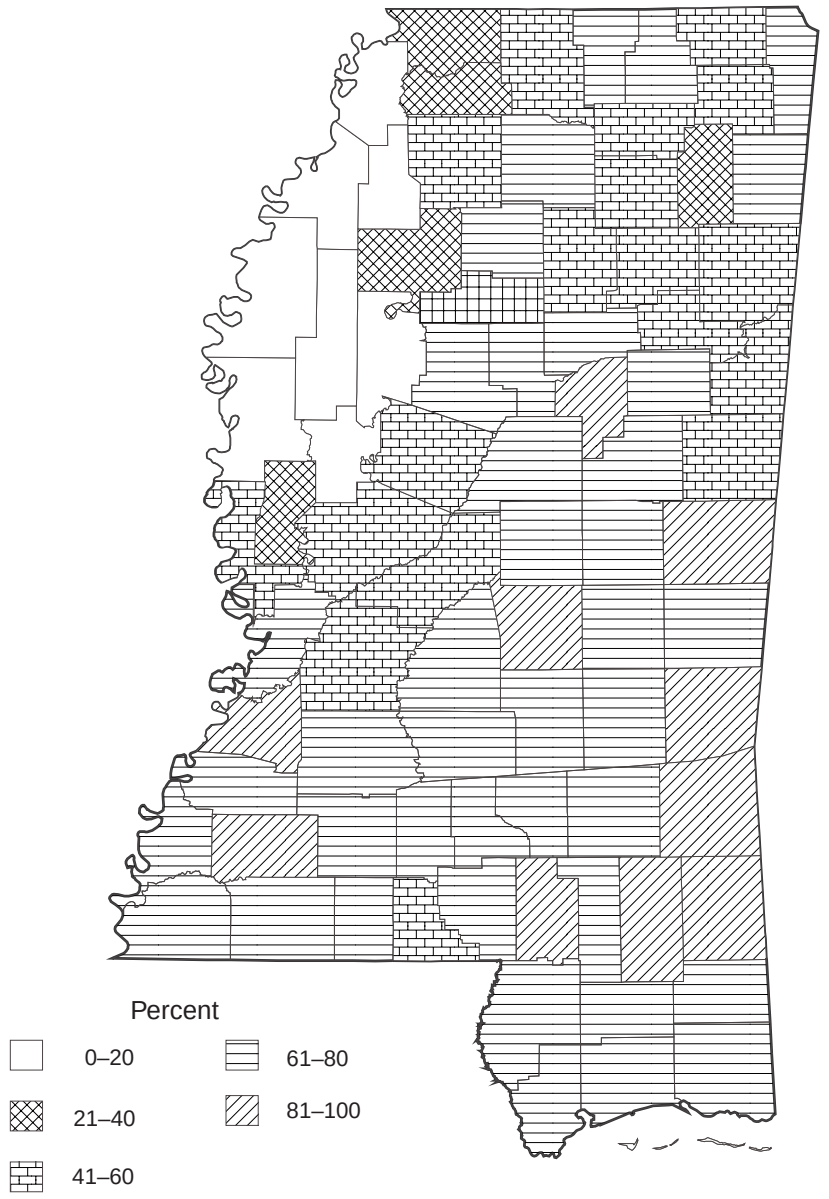

Figure 3—Percentage of county area in timberland, Mississippi, 1994.

timberland). Public-owned timberland was 2.0 million acres and represented 10 percent of all timberland in the State.

The most notable change in ownership trends since the 1987 survey was the large increase in NIPF timberland area (table III). There, timberland increased by 1.5 million acres. Most of the increase in NIPF was in the North unit (524,700 acres), but there were notable increases in the NIPF class in all the other units except the Delta. Little change in timberland area occurred in either the forest industry or public ownership class. There were no profound differences in ownership patterns among the five survey units with the exception of the Central and South units. Forest industry ownership was substantially higher in these two units (fig. 4).

Table III—Area of timberland by forest survey unit, ownership, and change, Mississippi, 1987 to 1994

Forest survey unit	All owners	Public	Change	Forest industry	Change	Nonindustrial private	Change
				Thousand acres			
Delta	1,543.6	195.1	18.0	187.9	51.3	1,160.7	82.3
Central	4,485.3	294.4	13.0	915.4	25.3	3,275.5	350.0
North	4,856.0	445.0	7.4	561.8	-78.5	3,849.2	524.7
South	4,666.2	685.7	-44.6	1,114.6	72.8	2,865.8	309.0
Southwest	3,036.2	330.7	23.0	458.0	-32.7	2,247.5	279.9
All units	18,587.3	1,950.9	16.8	3,237.6	38.1	13,398.8	1,545.8

Numbers in rows and columns may not sum to totals due to rounding.

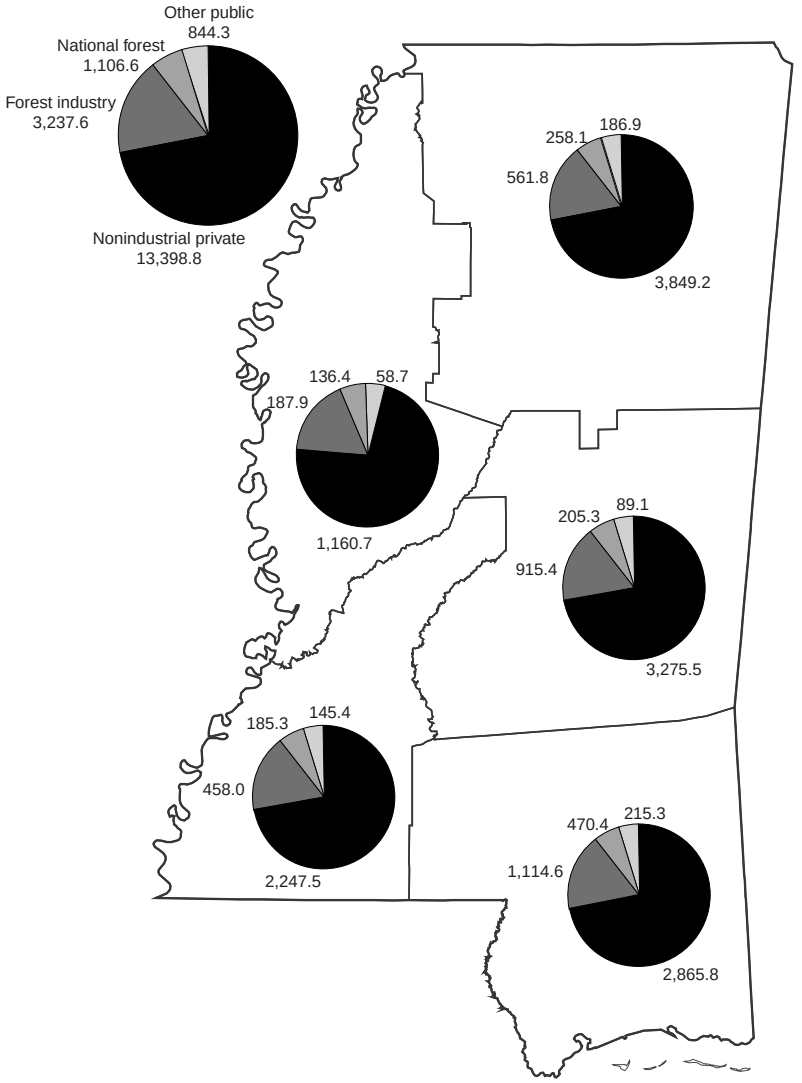

Figure 4—Proportion of timberland, in thousand acres, by ownership, Mississippi, 1994.

With 72 percent of timberland area in NIPF ownership, many Mississippi counties contained high concentrations of NIPF owners. There were 29 counties with more than 81 percent of timberland in NIPF ownership (fig. 5). These counties were distributed throughout the State but most were in the northern half. There were no counties with less than 20 percent of timberland in NIPF ownership.

Only one county in Mississippi had a high proportion of timberland in forest industry ownership. This was Issaquena County in the Delta unit (fig. 6). There were 29 counties with sizable forest industry holdings (21 to 40 percent of county timberland) scattered throughout the State, but heaviest concentrations were in the southern half. No counties had more than 60 percent of timberland in forest industry ownership.

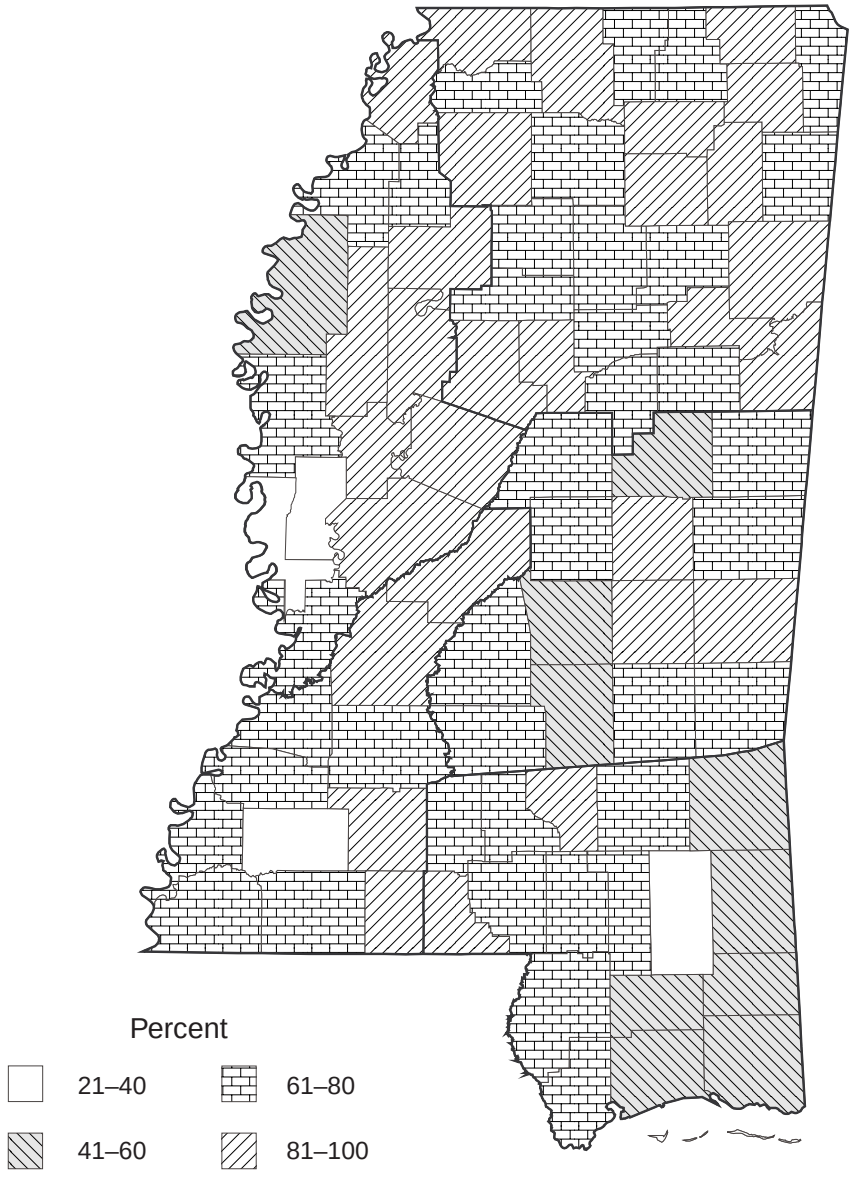

Figure 5—Percentage of county timberland held by nonindustrial private forest landowners, Mississippi, 1994. There were no counties with less than 20 percent of timberland in nonindustrial private forest ownership.

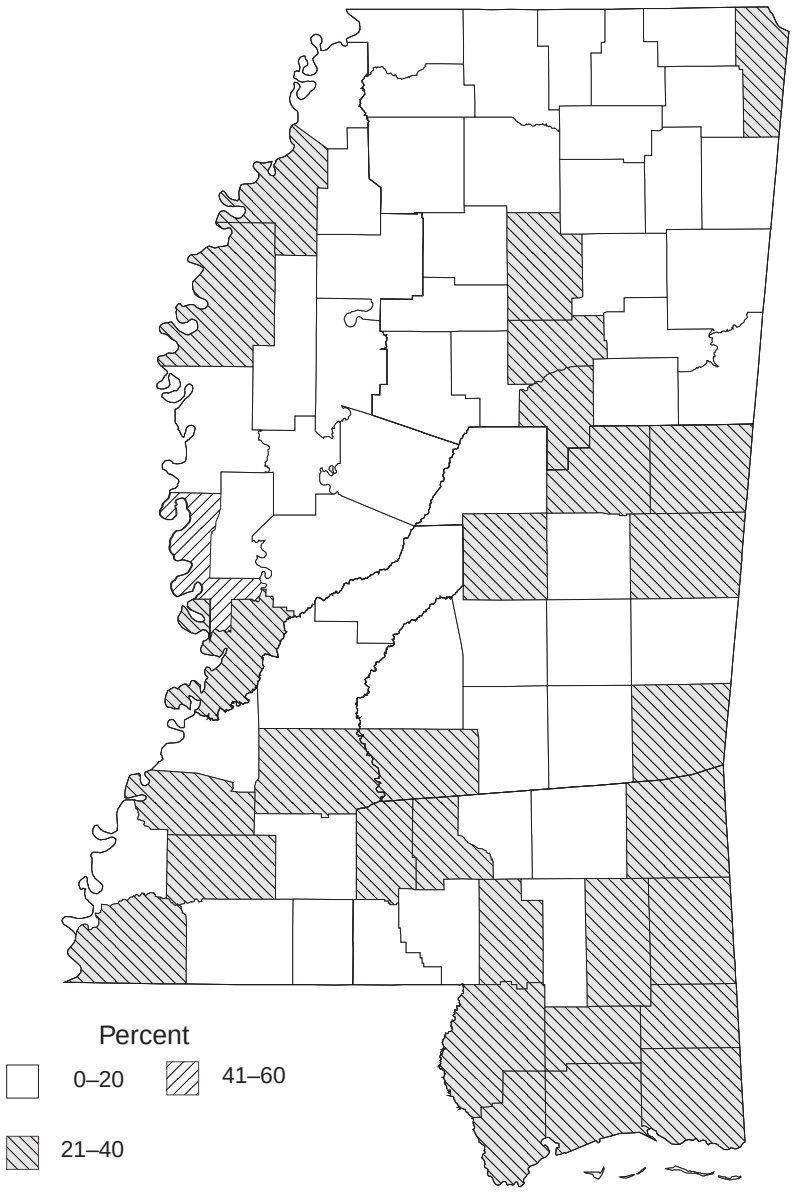

Figure 6—Percentage of county timberland held by forest industries, Mississippi, 1994. There were no counties with more than 60 percent of timberland in forest industry ownership.

Forest-Type Groups

The forest survey recognized six major forest-type groups in Mississippi. These were the longleaf-slash pine, loblolly-shortleaf pine, oak-pine, oak-hickory, oak-gum-cypress, and elm-ash-cottonwood forest-type groups. These groupings facilitate analysis and representation of data but may mask some important changes or trends in the resource. For example, some changes within the longleaf-slash pine type would not show up in the forest-type group classes, whereas detailed typing would reveal these trends. An example would be a shift from longleaf to slash pine plantings. Since they are both in the same forest-type group, a replacement of one with the other would go undetected (because the total area in the forest-type group would remain the same).

The predominant forest-type group in Mississippi was oak-hickory (31 percent of all timberland), followed closely by

loblolly-shortleaf pine (26 percent) (fig. 7). Ranked third was bottomland hardwoods (20 percent), followed closely by the oak-pine forest-type group (17 percent). The longleaf-slash forest-type group was a distant fifth occupying 5 percent of timberland area.

Regionally, the longleaf-slash forest-type group was restricted to the South unit with the exception of a small amount in the Central unit (fig. 7). Other survey units with prominent affinities for specific forest-type groups included the North unit with 45 percent of timberland in oak-hickory, and the Delta unit with 61 percent in bottomland hardwoods.

Trend information for Mississippi's six forest-type groups is presented in table IV. The largest change was in the loblolly-shortleaf forest-type group, with a 946,200-acre increase. Sixty-eight percent of this increase occurred in the Central

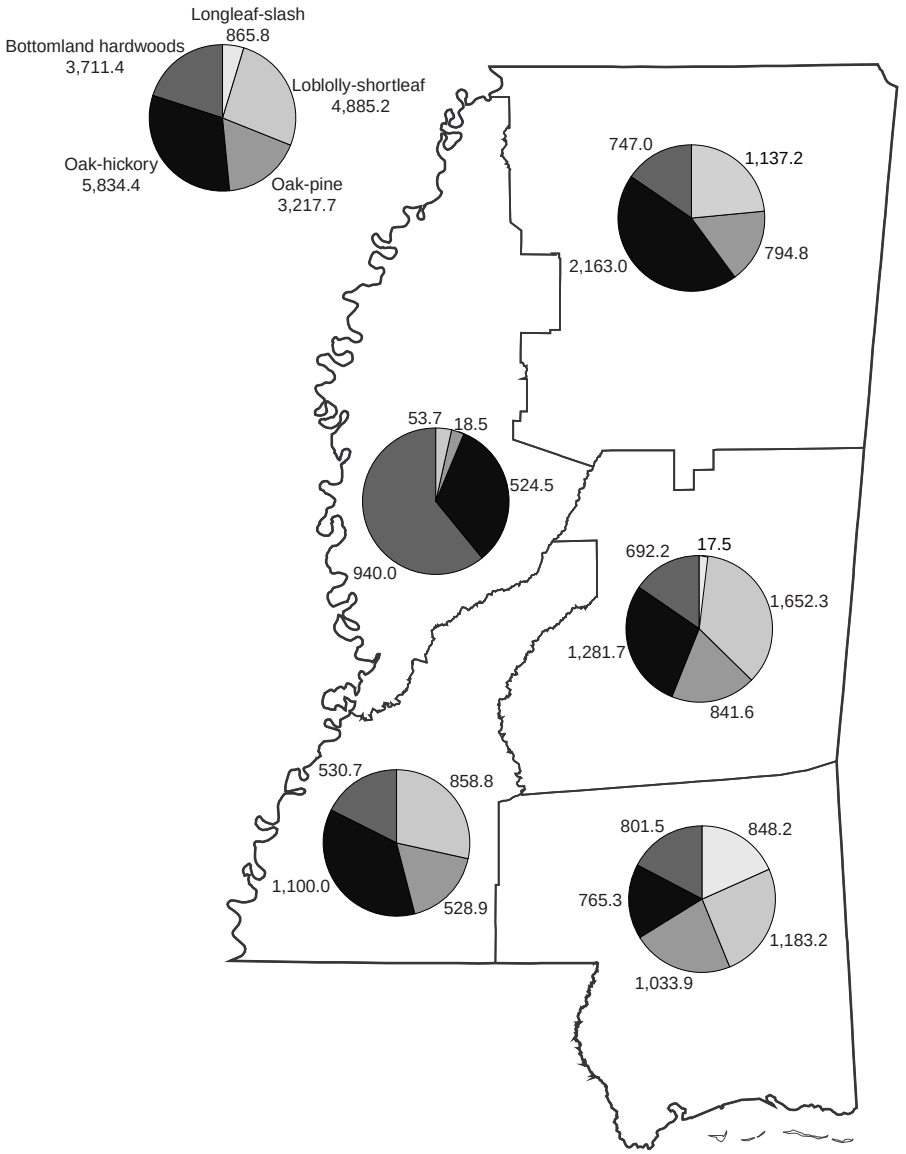

Figure 7—Proportion of timberland, in thousand acres, by forest-type group, Mississippi, 1994 (does not include 72,800 acres nontyped timberland). Bottomland hardwoods include the oak-gum-cypress and elm-ash-cottonwood forest-type groups.

Table IV—Area of timberland by forest survey unit, forest-type group, and change, Mississippi, 1987 to 1994

Forest survey unit	All types	Longleaf-slash	Change	Loblolly-shortleaf	Change	Oak-pine	Change	Oak-hickory	Change	Oak-gum-cypress	Change	Elm-ash-cottonwood	Change	Nontyped[a]
							Thousand acres							
Delta	1,543.6	0.0	0.0	53.7	15.3	18.5	-45.7	524.5	77.1	859.1	91.4	80.9	6.5	6.9
Central	4,485.3	17.5	0.5	1,652.3	343.9	841.6	-68.8	1,281.7	30.9	686.6	76.2	5.6	5.6	0.0
North	4,856.0	0.0	0.0	1,137.2	189.4	794.8	-112.2	2,163.0	250.0	716.1	122.6	30.9	-2.3	14.0
South	4,666.2	848.2	7.6	1,183.2	301.7	1,033.9	-24.8	765.3	-59.2	801.5	83.3	0.0	-5.5	34.1
Southwest	3,036.2	0.0	0.0	858.8	95.8	528.9	-0.3	1,100.0	16.6	497.5	140.0	33.2	0.4	17.8
All units	18,587.3	865.8	8.1	4,885.2	946.2	3,217.7	-251.8	5,834.4	315.4	3,560.8	513.5	150.6	4.6	72.8

Numbers in rows and columns may not sum due to rounding.

[a] Stocking < 16.7 percent.

and South units. There were notable increases in the oak-hickory and oak-gum-cypress forest-type groups, 315,400 and 513,500 acres, respectively. Only one unit (South) had a decrease in the oak-hickory forest-type group. The timberland area in this type dropped by 59,200 acres. One possible explanation for this was the conversion of oak-hickory lands to planted pines.

The oak-pine forest-type group was the only type to lose timberland area. This forest-type group declined by 251,800 acres since 1987. Every unit showed a decrease in this forest-type group, with the largest in the North unit (112,200 acres). Much of the oak-pine type probably converted to oak-hickory as the more valuable pines were removed. Another diversion could be to the loblolly-shortleaf forest-type group, where loblolly pine plantations were established after the oak-pine types were clearcut.

Stand Volume

The timber inventory for all live trees greater than or equal to 5.0 inches d.b.h. was 22,649.2 million cubic feet. This was approximately 287.5 million cubic feet more (1 percent) than in 1987 and, for all practical purposes, was not a noteworthy change. A decline in the softwood inventory (111.2 million cubic feet) was offset by an increase in the hardwood inventory (398.7 million cubic feet).

Most of Mississippi's inventory was in growing-stock trees, 20,611.1 million cubic feet or 91 percent. Of this growing-stock volume, 72 percent was in sawtimber trees while the remaining 28 percent was in poletimber trees.

Sawtimber volume for the 1994 inventory was 77,189.9 million board feet. This was only a small increase over the 1987 inventory (757.2 million board feet or 1 percent). Fifty-one percent of the inventory was in softwoods while hardwoods totaled 49 percent.

A small portion of the inventory was in cull trees. The inventory showed 1,704.6 million cubic feet in rough trees and 333.5 million cubic feet in rotten trees. Together, rough-and-rotten cull trees made up 9 percent of Mississippi's live-tree volume. Additionally, another 108.2 million cubic feet were in salvable dead trees. Note that the salvable dead volume was not included in the total live-tree volume. Additionally, the salvable dead estimate was very conservative because of the periodic nature of sampling in the forest survey. Biologically, most trees are salvable when they die. If they were not tallied in the sample soon after death, they would not meet the criteria necessary to be classed as salvable dead, i.e., decay will have progressed too far.

Softwood Volume

The softwood volume for the 1994 inventory was 9,362.5 million cubic feet (table V). This was a 111.2-million-cubic-foot decrease from the previous inventory. All of the forest survey units showed declines in softwood volume with the exception of the South unit. There, volume increased by 290.2 million cubic feet, offsetting somewhat the 401.4-million-cubic-foot loss in the other four survey units.

Table V—Change in live-tree volume by forest survey unit, Mississippi, 1987 to 1994

Forest survey unit	Softwood		Hardwood	
	Volume	Change	Volume	Change
	Million cubic feet			
Delta	122.8	-25.4	2,376.6	134.4
Central	2,888.9	-0.2	2,594.3	-72.5
North	1,756.4	-276.1	3,546.4	143.8
South	2,839.0	290.2	2,143.4	79.9
Southwest	1,755.4	-99.7	2,625.9	113.0
All units	9,362.5	-111.2	13,286.7	398.7

Numbers in columns may not sum to totals due to rounding.

Softwood live-tree volume was 41 percent of the total volume for the State. This was a very minor change, but still a decrease from the proportion for the 1987 survey where softwoods made up 42 percent of the volume. There were only two of Mississippi's five survey units with softwood volume comprising more than 50 percent of total volume, the Central and South units (fig. 8). Of all five units, only one unit showed appreciable change in proportions of softwood to hardwood. The North unit decreased from 37 percent softwoods in 1987 to 33 percent softwoods in 1994.

Most of Mississippi's live-tree softwood volume was in NIPF ownership, 5,548.8 million cubic feet or 59 percent of total volume (table VI). This was a decrease from that reported for the 1987 survey and was mostly due to the 349.2-million-cubic-foot decrease in NIPF softwood volume. Both the NIPF- and national forest-owned lands had decreases in volume. National forest softwood volume decreased a modest 8.1 million cubic feet. Other public- and forest industry-owned lands had increases of 56.6 million cubic feet and 189.4 million cubic feet, respectively. Although the decreases were small, this was the second consecutive survey where national forest softwood volume

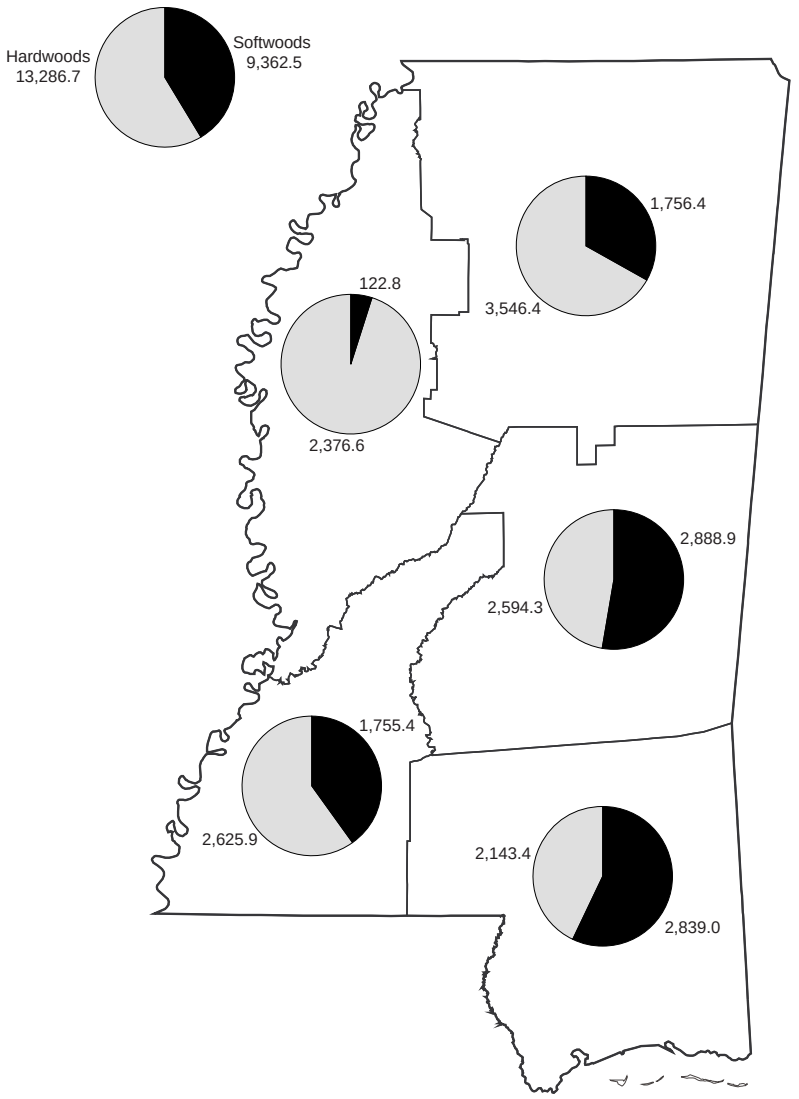

Figure 8—Proportion of live-tree volume, in million cubic feet, by species group, Mississippi, 1994.

Table VI—Change in live-tree volume by ownership class, Mississippi, 1987 to 1994

Ownership class	Softwood		Hardwood	
	Volume	Change	Volume	Change
	Million cubic feet			
National forest	1,383.1	-8.1	882.4	34.4
Other public	514.6	56.6	911.5	134.3
Forest industry	1,916.0	189.4	1,598.9	-17.5
Nonindustrial private	5,548.8	-349.2	9,893.9	247.5
All classes	9,362.5	-111.2	13,286.7	398.7

Numbers in columns may not sum to totals due to rounding.

had declined. Forest industry softwood volume had also decreased at the time of the previous survey, but increased substantially by the 1994 survey.

Since the 1987 survey, two important changes occurred in the distribution of softwood volume among the diameter classes. First, volume decreased in the 8- through 14-inch diameter classes (fig. 9). Second, there was an increase in volume in the 18-inch and larger diameter classes. The decrease of volume in trees in the 8- through 14-inch diameter classes indicated that harvesting activity was most prevalent in the smaller sawtimber-sized trees. Between 1987 and 1994, softwood live-tree volume decreased 506.0 million cubic feet in the 8- through 14-inch diameter classes. Ultimately, this means less volume for trees in the larger diameter classes in future years. The good news was that volume increased by 160.5 million cubic feet in the 18-inch diameter class and larger. Even with this increase, only 21 percent of softwood volume was in the larger trees.

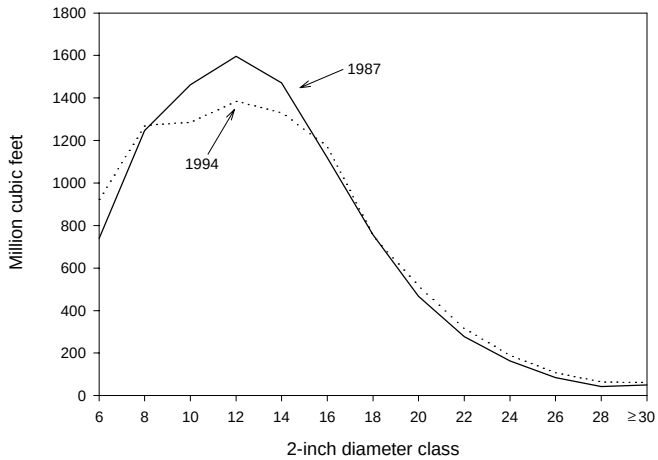

Figure 9—Softwood live-tree volume by diameter class, Mississippi, 1987 and 1994.

However, arguing the case for larger trees, this was an improvement over the 1987 survey, where only 19 percent of softwood volume was in larger diameter trees.

Loblolly pine continued to lead the State in softwood volume with 5,943.0 million cubic feet. This was an impressive 63 percent of total softwood volume. Since 1987, loblolly volume has increased by 323.3 million cubic feet, a 6-percent increase (fig. 10).

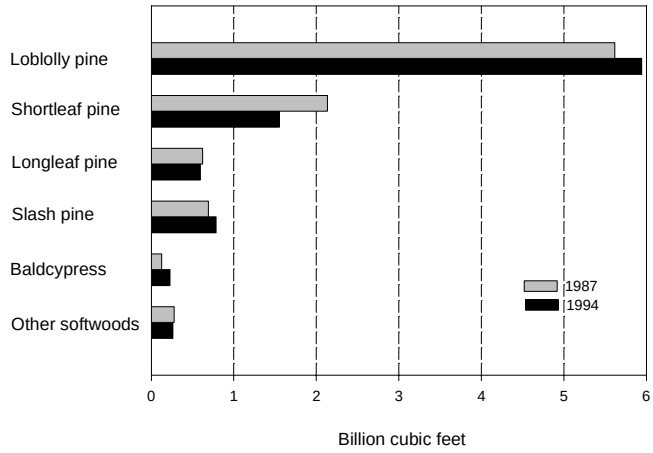

Figure 10—Softwood live-tree volume by species, Mississippi, 1987 and 1994.

Shortleaf pine ranked second to loblolly pine with 1,553.0 million cubic feet. However, shortleaf pine volume continued to decline. Between 1977 and 1987, volume had dropped from 2,476.0 million cubic feet to 2,135.0 million cubic feet, a 14-percent decrease. The decrease continued between the 1987 and 1994 surveys; from 2,135.0 million cubic feet to 1,553.0 million cubic feet, a 27-percent decrease. As older shortleaf stands are harvested, many are being replanted with loblolly pine. It is uncertain how far the shortleaf pine decline will go.

Slash pine ranked third in live-tree softwood volume and has showed a steady increase over the last two decades. In 1977, slash pine volume was 655.0 million cubic feet. In 1987, it rose to 693.0 million cubic feet, and in 1994, was 783.0 million cubic feet. It is probably still being favored over longleaf pine in areas where planting and environmental conditions favor its continued use.

Of most concern is the continued decrease of longleaf pine. It declined from 646.0 million cubic feet in 1977 to 623.0

million cubic feet in 1987 to 597.0 million cubic feet in 1994. This was a decrease of 8 percent since 1977. In the 1994 survey, longleaf pine constituted only 6 percent of total softwood volume in Mississippi.

The softwood volume of Mississippi was not distributed evenly across the landscape. A typical pattern of this distribution is illustrated in the effective density graphs in figure 11. The timberland area was composed of many acres with little softwood volume in each stand and a few acres with a large proportion of the softwood volume. For instance, when considering the entire State, there were 12.7 million acres (68 percent) of timberland made up of stands with less than 500 cubic feet per acre of softwood volume.

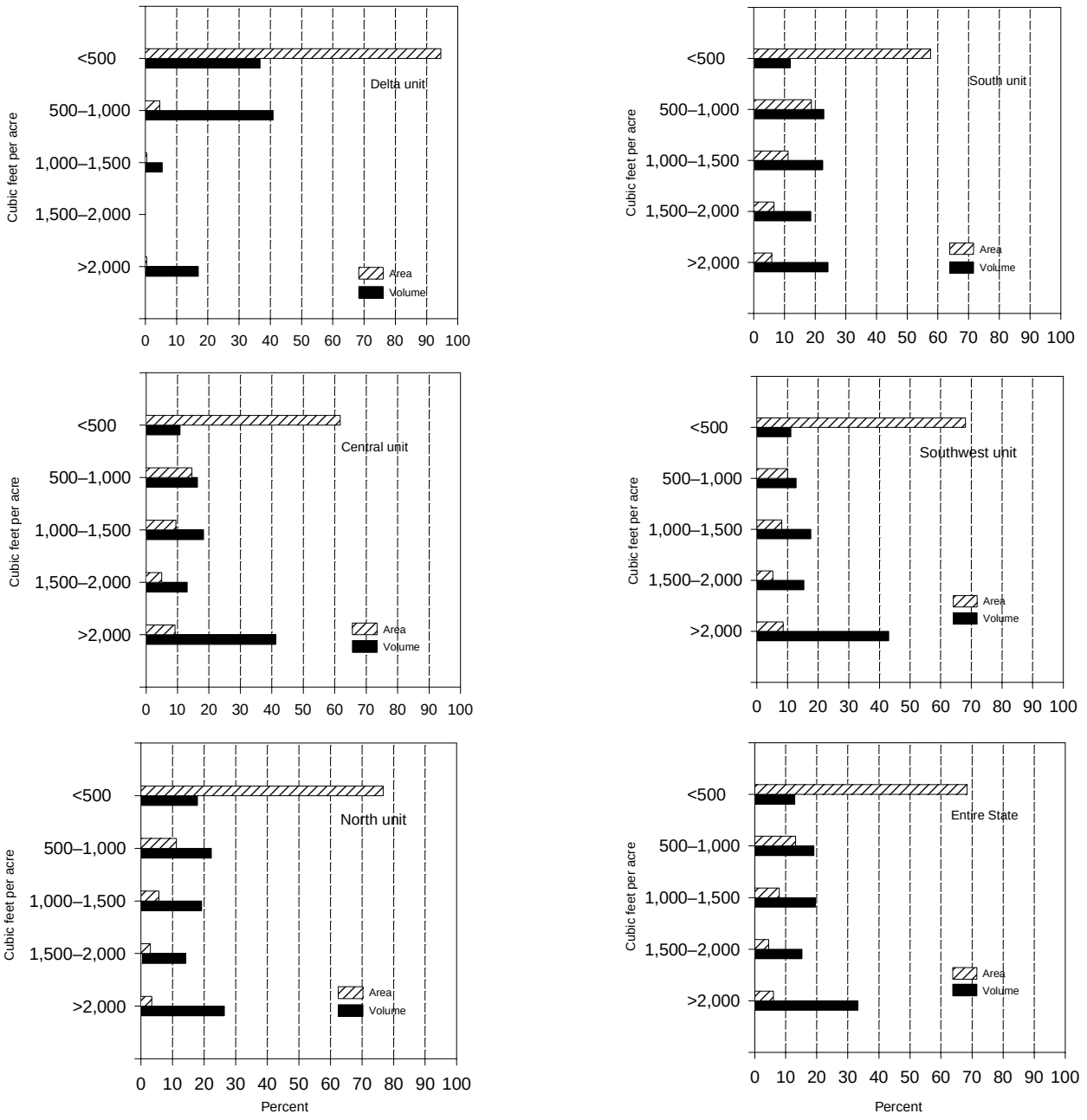

Figure 11—Timberland area and live-tree volume of softwoods by stand-volume class, Mississippi, 1994.

Thirteen percent, or 1,204.5 million cubic feet, of the State's softwood volume was in these stands. In contrast to this were 1.1 million acres (6 percent) of timberland in stands with more than 2,000 cubic feet per acre. However, on this relatively small amount of area, there was 3,122.0 million cubic feet of the softwood volume, 33 percent of the State's softwood inventory.

This pattern was evident in almost all of the State's survey units. One exception was the Delta unit where softwoods did not contribute a substantial amount to Mississippi's softwood inventory. As expected, 95 percent of timberland area in this unit was made up of stands with less than 500 cubic feet per acre of softwood volume. Also noteworthy were the Central and Southwest units. Both had high amounts of timberland area in stands composed of less than 500 cubic feet per acre of softwood volume, as typical of the other units. However, the big difference was the amount of volume in stands with more than 2,000 cubic feet per acre. Here, the Central unit had 1,194.0 million cubic feet (41 percent) and the Southwest unit had 755.0 million cubic feet (43 percent) of softwood volume. With these exceptions, softwood volume was fairly evenly distributed among the other stand-volume classes (fig. 11).

Softwood Sawtimber Volume

In 1994, the softwood sawtimber inventory was 39,337.7 million board feet—a 1,271.3-million-board-foot decrease (3 percent) from that reported for the 1987 survey (table VII). All of the survey units showed a decrease, with the exception of the South unit, which showed a 767.3-million-board-foot increase. The largest decrease was in the North unit, 897.0 million board feet (12 percent).

Table VII—Change in sawtimber volume by forest survey unit, Mississippi, 1987 to 1994

Forest survey unit	Softwood		Hardwood	
	Volume	Change	Volume	Change
	Million board feet[a]			
Delta	487.8	-48.6	8,366.5	1,025.7
Central	12,726.7	-485.5	6,675.1	-276.1
North	6,682.7	-897.0	9,533.9	440.7
South	10,758.7	767.3	5,000.8	241.5
Southwest	8,681.8	-607.5	8,275.8	596.7
All units	39,337.7	-1,271.3	37,852.2	2,028.5

Numbers in columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

As with live-tree volume, most of Mississippi's softwood sawtimber volume was in NIPF ownership (table VIII). Sawtimber volume was 57 percent versus 59 percent for live-tree volume on NIPF land. Interestingly, only the NIPF ownership showed a decrease in the softwood inventory since the 1987 survey. The decrease was substantial, 2,197.7 million board feet (a 9-percent decline), but was somewhat offset by moderate increases in all of the other ownership categories (table VIII.)

Table VIII—Change in sawtimber volume by ownership class, Mississippi, 1987 to 1994

Ownership class	Softwood		Hardwood	
	Volume	Change	Volume	Change
	Million board feet[a]			
National forest	7,465.7	198.3	2,632.2	290.4
Other public	2,703.4	461.0	3,168.2	620.9
Forest industry	6,726.1	267.1	4,600.8	82.8
Nonindustrial private	22,442.5	-2,197.7	27,450.9	1,034.5
All classes	39,337.7	-1,271.3	37,852.2	2,028.5

Numbers in columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

In contrast to softwood live-tree volume (where softwoods were only 41 percent of total volume), softwood sawtimber volume was 51 percent of the total sawtimber volume for the State. Although impressive, it should be noted that this was 2 percent less than the proportion in the 1987 survey, when softwood sawtimber was 53 percent of the total volume. Three of Mississippi's survey units had more than 50 percent of sawtimber volume in softwoods (fig. 12). Together, the Central and South units contained 60 percent of the State's softwood sawtimber volume. This proportion was a very slight decrease from 57 percent in the 1987 survey.

As was true of live-tree softwood volume, sawtimber softwood volume was not distributed evenly across the State. Sixty-four percent (12.0 million acres) of timberland had less than 1,000 board feet per acre (fig. 13). This was an increase in this stand-volume class from the 9.7 million acres (57 percent of the total timberland) reported in 1987. Some of this increase can be attributed to land that has reverted to forest since 1987, when volume on those acres was not likely to be of sawtimber size.

Most noteworthy in the effective density graphs was the proportion of volume in stands with more than 9,000 board

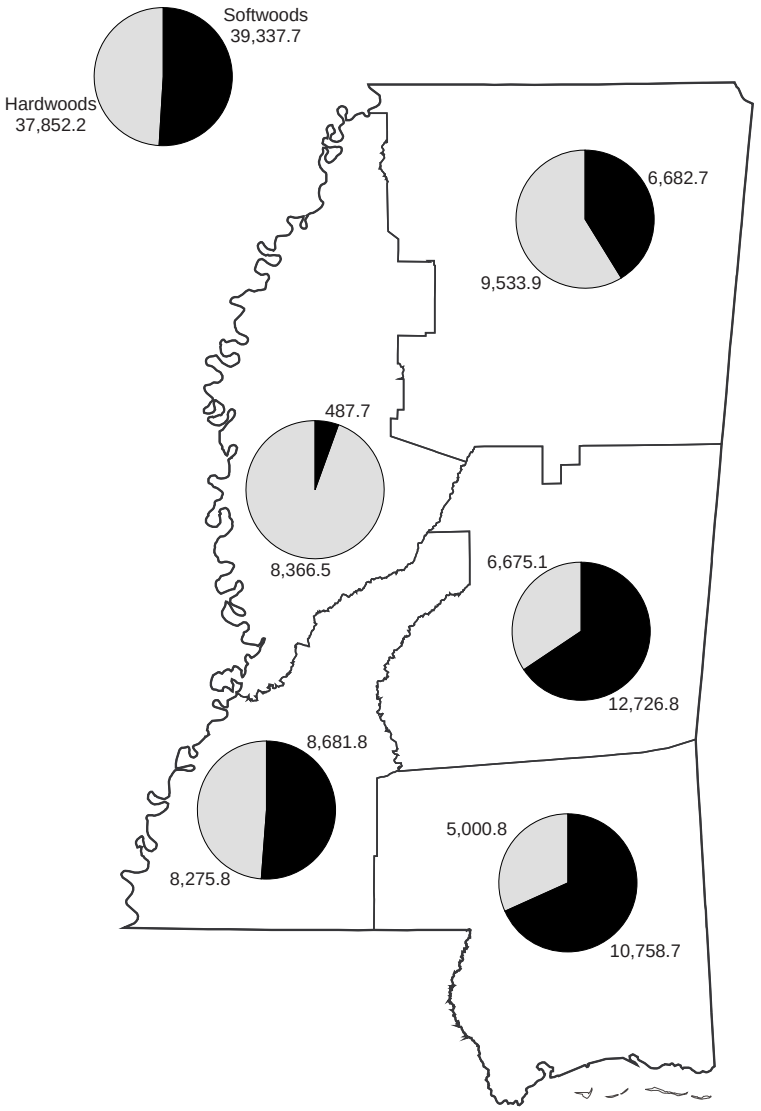

Figure 12—Proportion of sawtimber volume, in million board feet, by species group, Mississippi, 1994.

feet per acre (fig. 13). In 1994, 47 percent of Mississippi's softwood sawtimber volume was situated on only 7 percent of timberland area (1.3 million acres). There was a slight increase in the actual acreage in this stand-volume class since the 1987 survey, but the proportion to total timberland area decreased from 7.4 percent to 6.9 percent. The proportional decrease was due in part to the 1.6 million new acres added to the timberland base in the 1994 survey. Volume in this class increased from 16,948.6 million board feet to 18,618.6 million board feet, a 1,670.0-million-board-foot increase. Similar patterns were observed in the other survey units. The Southwest unit had the highest proportion of softwood sawtimber volume in the more than 9,000-board-foot-per-acre stand-volume class. There, 59 percent (5,143.0 million board feet) of the total softwood sawtimber volume was situated on only 11 percent of the unit's timberland area (322,000 acres). However, the Central unit had the most sawtimber volume in this class, 7,140.8 million board feet (56 percent of the unit's volume). With the exception of the less than 1,000-board-foot-per-acre and the more than 9,000-board-foot-per-acre stand-volume classes, there was a fairly even distribution of softwood sawtimber volume in the four remaining stand-volume classes (fig. 13).

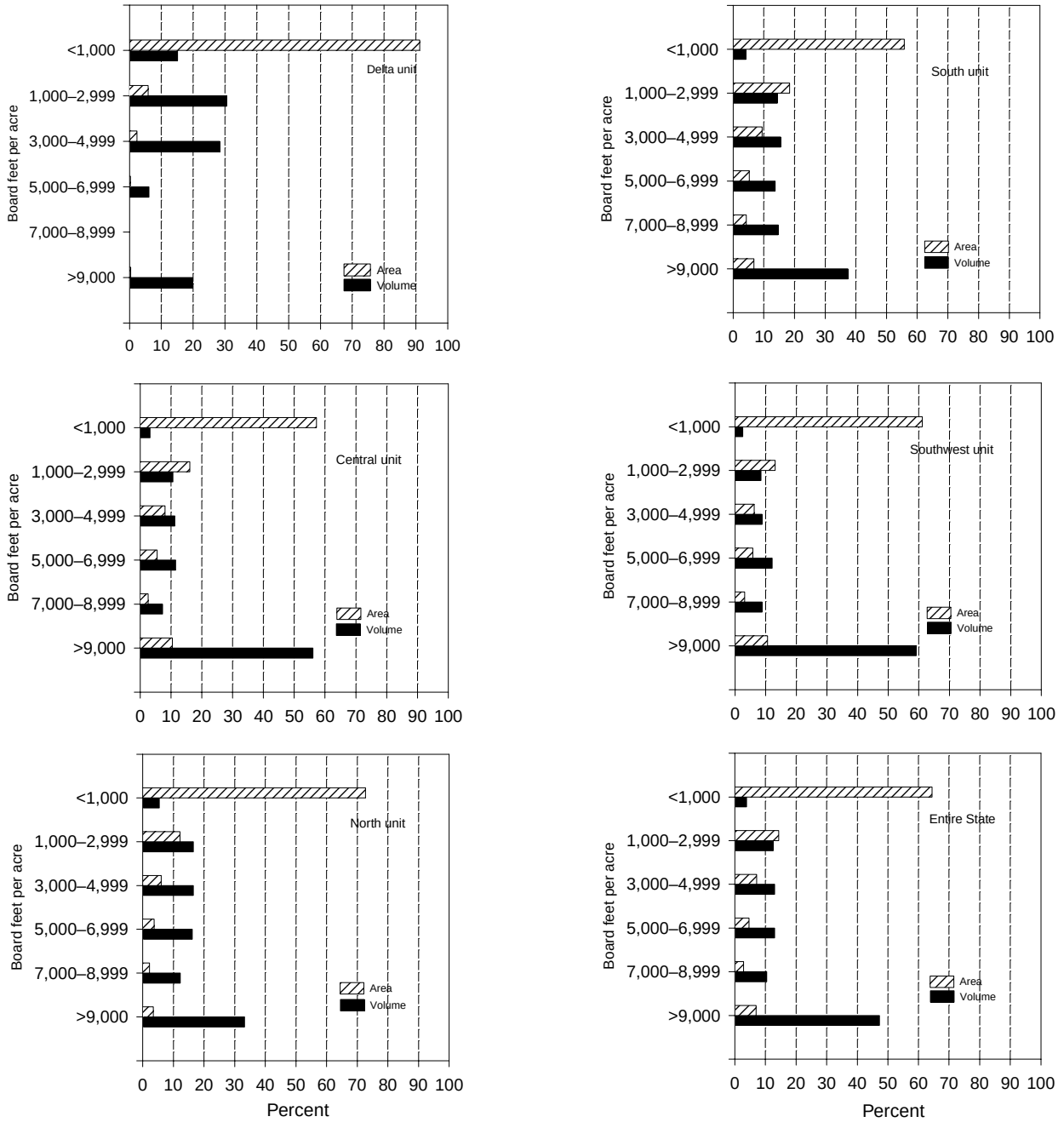

Figure 13—Timberland area and sawtimber volume of softwoods by stand-volume class, Mississippi, 1994.

Hardwood Volume

Hardwood live-tree volume was 13,286.7 million cubic feet in 1994. This was a 398.7-million-cubic-foot increase over the 1987 survey (table V). Volume increased in all of the survey units with the exception of the Central unit, which had a 72.5-million-cubic-foot decrease. The increases were evenly dispersed among the other units. The North unit had the highest amount of hardwood volume, 27 percent of the total. Beyond that, the remaining volume was fairly evenly distributed among the other survey units.

The largest concentration of hardwood live-tree volume was in NIPF ownership. Approximately 74 percent of the volume (9,893.9 million cubic feet) was in this ownership class (table VI). Forest industry ranked second with 12 percent of the hardwood volume (1,598.9 million cubic feet). Hardwood volume increases since 1987 were evident in every ownership class with the exception of forest industry. There, volume decreased, but only slightly (17.5 million cubic feet, approximately 1 percent).

There was no substantial change in the distribution of hardwood live-tree volume by diameter class between the two surveys (fig. 14). There were no obvious strong departures anywhere along the curve. The volume was down slightly in the 6- to 10-inch diameter classes but up slightly in the 16- through 30-inch and larger diameter classes.

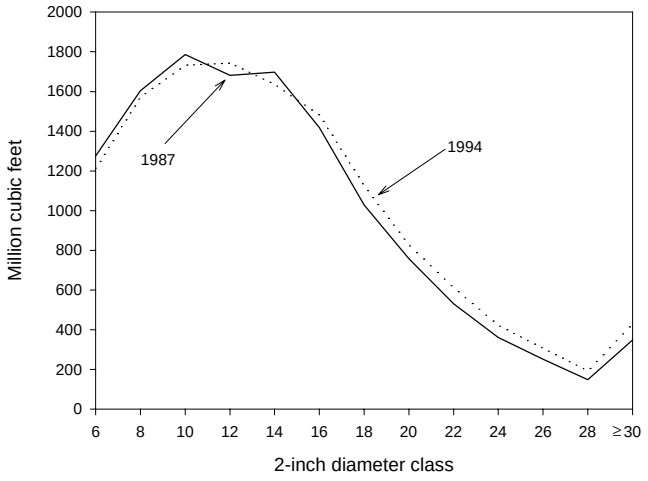

Figure 14—Hardwood live-tree volume by 2-inch diameter class, Mississippi, 1987 and 1994.

The hardwood volume increase in larger diameter trees was encouraging for hardwood quality. Hardwood trees must be at least 16 inches d.b.h. before they can qualify for tree grade 1. The volume in trees at the 16-inch and larger diameter classes increased by 547.5 million cubic feet. Note that this was even more than the 398.7-million-cubic-foot net increase for hardwood volume in table V. The volume loss in the 6-, 8-, and 10-inch diameter classes offset somewhat the 547.5-million-cubic-foot gain in the larger diameters.

There were no substantial changes in volume among most of the more common hardwood species and species groups (fig. 15). Among oaks, there were decreases in select white oaks, other white oaks, and other red oaks; only select red oaks showed a volume increase, 92 million cubic feet (13 percent). The largest change of any hardwood category was the increase in sweetgum volume. This increase (126.0 million cubic feet) was even more than the aggregated, other hardwood, category (110.0 million cubic feet). Sweetgum was also the leading hardwood in total volume with 2,190.0 million cubic feet.

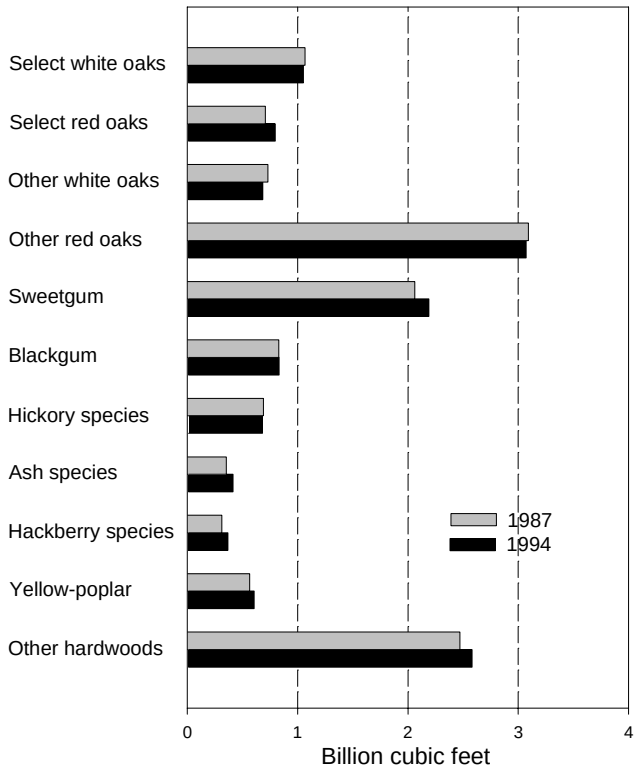

Figure 15—Hardwood live-tree volume by species, Mississippi, 1987 and 1994. See definitions in appendix for species included in select white oaks and select red oaks.

As with softwoods, the distribution of live-tree hardwood volume was not distributed evenly across the State. There were many acres with less than 500 cubic feet per acre of hardwoods and few acres with more than 2,000 cubic feet per acre (fig. 16). In 1994, 56 percent of Mississippi timberland (10.3 million acres) was composed of stands with less than 500 cubic feet per acre in hardwoods. Approximately 10 percent of the total hardwood volume (1,348.9 million cubic feet) was on this type of timberland. In contrast, only 10 percent of Mississippi's timberland (1.8 million acres) was composed of stands where hardwood volume was more than 2,000 cubic feet per acre. However, this was where 35 percent of the hardwood volume (4,641.5 million cubic feet) was found.

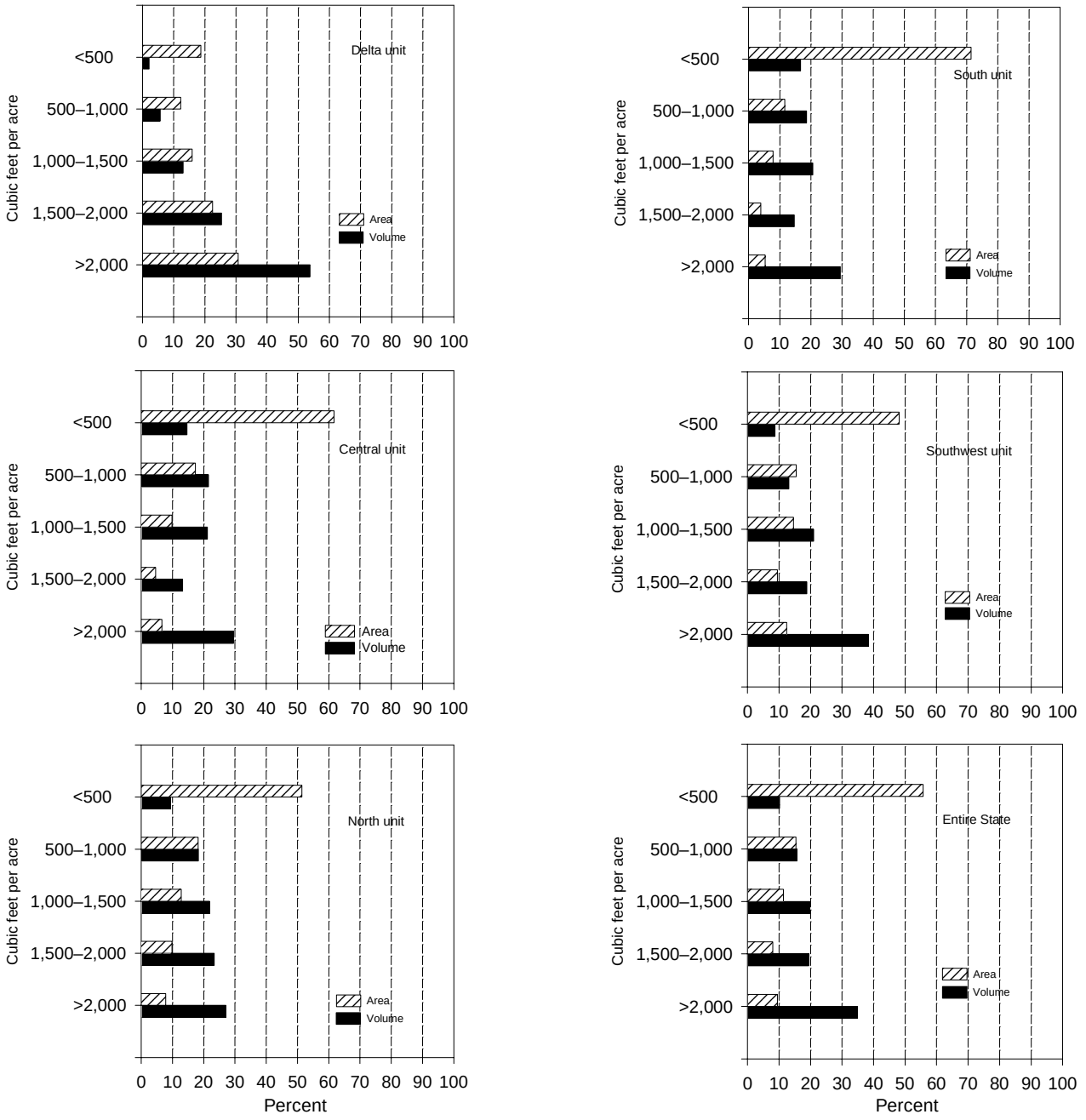

Figure 16—Timberland area and live-tree volume of hardwoods by stand-volume class, Mississippi, 1994.

The volume distributions were a change from those of the 1987 survey. In 1987, 51 percent of total timberland (8.6 million acres) was in stands with less than 500 cubic feet per acre in hardwoods; in 1994, 56 percent of timberland (10.3 million acres) was in this volume class. There was 9 percent of timberland (1.6 million acres) in the high stand-volume class (more than 2,000 cubic feet per acre) in 1987; in 1994, there was 10 percent (1.8 million acres). Although the percentage (proportional) change was small, the actual acreage change was substantial because of the difference in timberland area between the 1987 and 1994 surveys.

Noteworthy was the distribution of volume in the Delta unit. This unit displayed an inverse of what State surveys usually show. In the Delta unit, the amounts of timberland area and volume increased from the less than 500 to the more than 2,000-cubic-foot-per-acre volume classes. Thirty percent of timberland (437,700 acres) was in the high-volume class along with 54 percent (1,279.5 million cubic feet) of the unit's hardwood volume.

Hardwood Sawtimber Volume

In 1994, the volume of hardwood sawtimber was 37,852.2 million board feet. This was a 2,028.5-million-board-foot increase since the 1987 survey (table VII). All survey units showed an increase, except for the Central unit where volume decreased by 276.1 million board feet. The largest increase was in the Delta unit. There, volume increased by 1,025.7 million board feet (14 percent). Although substantial, this increase was not as great as the increase in 1987, when 1,809.5 million board feet were added to the unit.

As with softwoods, most of the hardwood sawtimber was in the NIPF ownership, 27,450.9 million board feet (73 percent). All of the ownership classes showed increases but the largest were in the NIPF and other public with 1,034.5 and 620.9 million board feet, respectively.

Mississippi has edged slightly closer to becoming a hardwood State (a State with more hardwood sawtimber than softwood sawtimber). Forty-nine percent of the sawtimber volume was in hardwoods, an increase over the 47 percent reported for the 1987 survey. Only two survey units had most of their sawtimber volume in hardwood, the Delta and North units (fig. 12). The Southwest unit had an almost equal proportion of volume between hardwood and softwood, 49 versus 51 percent, respectively.

The distribution of hardwood sawtimber volume was similar to hardwood live-tree volume. Sixty percent of timberland (11.0 million acres) had hardwood stands of less than 1,000 board feet per acre (fig. 17). In contrast, 5 percent of timberland (946,100 acres) was in hardwood stands of more than 9,000 board feet per acre. These are changes from proportions in 1987 where 55 percent of timberland (9.3 million acres) was in hardwood sawtimber stands of less than 1,000 board feet per acre. Five percent of timberland (834,100 acres) was in high-volume sawtimber stands (more than 9,000 board feet per acre). Even though relative proportions were similar, actual acreage was substantially different because of differences in the total timberland acreage between 1987 and 1994, i.e., 5 percent of 18.6 million acres is much different from 5 percent of 17.0 million acres.

Stand Structure

Stand Size

The FIA survey defines stand size by three classes: sawtimber, poletimber, and sapling-seedling stands (see appendix for definitions). The State had almost equal proportions of timberland in sawtimber and sapling-seedling stands (fig. 18). There were only slightly more sawtimber stands than sapling-seedling stands, 7.7 million acres (42 percent) versus 7.0 million acres (38 percent), respectively.

Only two survey units had more than 50 percent of their timberland dominated by a single stand-size class. The Delta unit and the Southwest unit had 72 and 52 percent of their timberland, respectively, in sawtimber stands. The remaining three units (Central, North, and South) had the highest plurality in sapling-seedling stands, 41, 42, and 41 percent, respectively. The North unit had the most timberland in sapling-seedling stands, 2.0 million acres, but this is only slightly more than the Central and South units.

Only one stand-size class had substantial change since the 1987 survey. Sapling-seedling-sized stands increased by 1.5 million acres (table IX). Much of this came from the addition of new timberland to the State. By far, the North unit had most of the increase, 709,900 acres (46 percent). The Central and Southwest units also had substantial increases in sapling-seedling stands, 361,800 and 252,000 acres, respectively. Sawtimber and poletimber stands had some noteworthy changes after 1987, but gains in one unit were offset by losses in another unit, resulting in very little change for the State (table IX).

Almost all of the notable stand-size changes were in the NIPF ownership. There, 1.7 million acres of sapling-seedling stands were added, bringing the 1994 NIPF acreage up to 5.3 million acres (table X). This made the amount of sapling-seedling stands almost equal to the sawtimber stand area in NIPF ownership.

Other noteworthy ownership trends were in forest industry. There, more timberland area was in sapling-seedling stands than in any other stand-size class. A total of 1.3 million acres (41 percent) were in this class, even with a 163,200-acre decrease since the last survey (table X). Sawtimber stands were ranked second, 33 percent of all forest industry timberland.

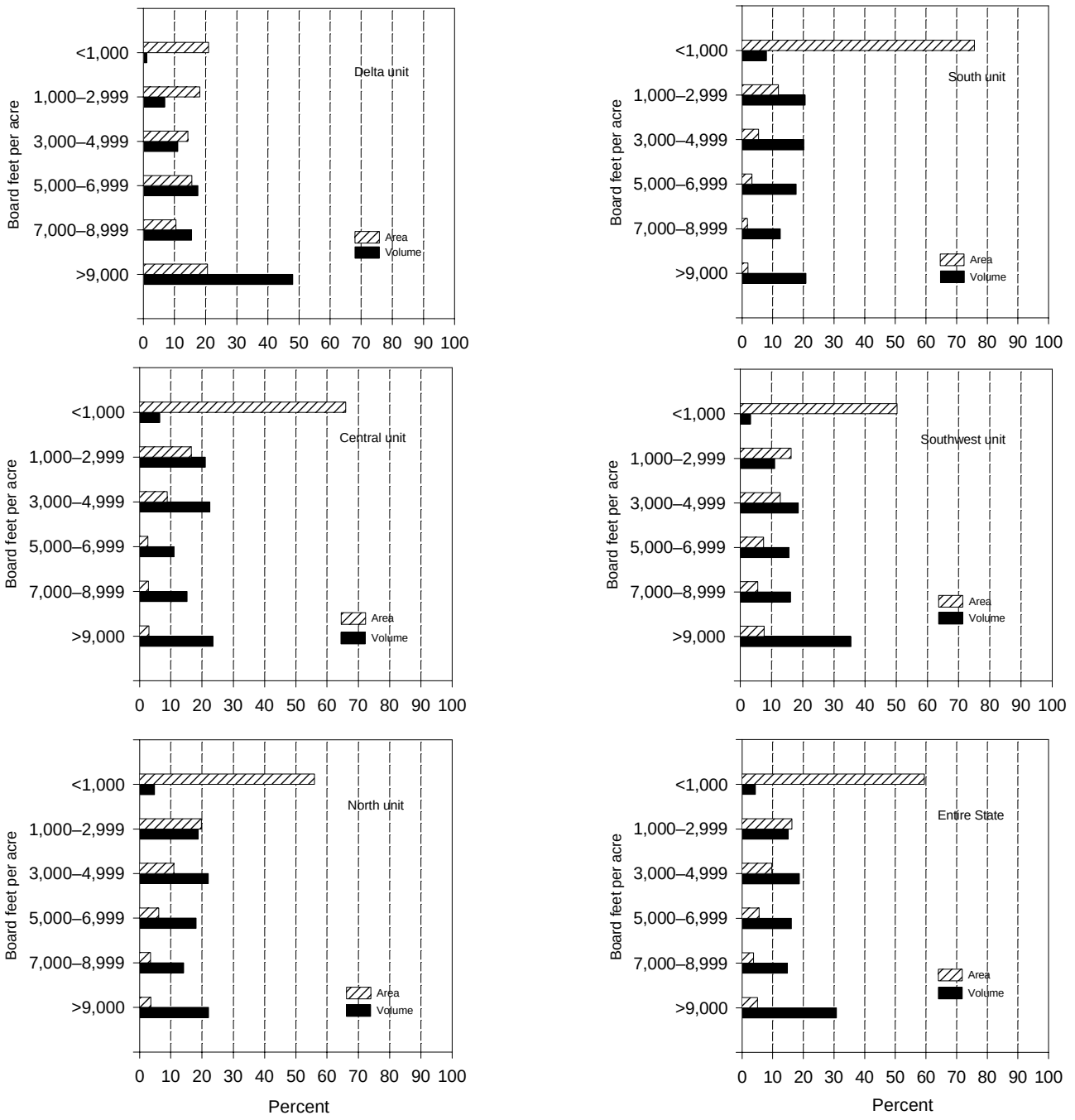

Figure 17—Timberland area and sawtimber volume of hardwoods by stand-volume class, Mississippi, 1994.

Another noteworthy trend was the proportion of sawtimber timberland in public ownership. National Forests in Mississippi had 68 percent of respective timberland in sawtimber-sized stands. Similarly, other public lands had 66 percent of timberland in sawtimber-sized stands (table X). Decreased harvesting pressure on public lands has allowed those stands to mature, leaving fewer acres in poletimber- and sawtimber-sized stands.

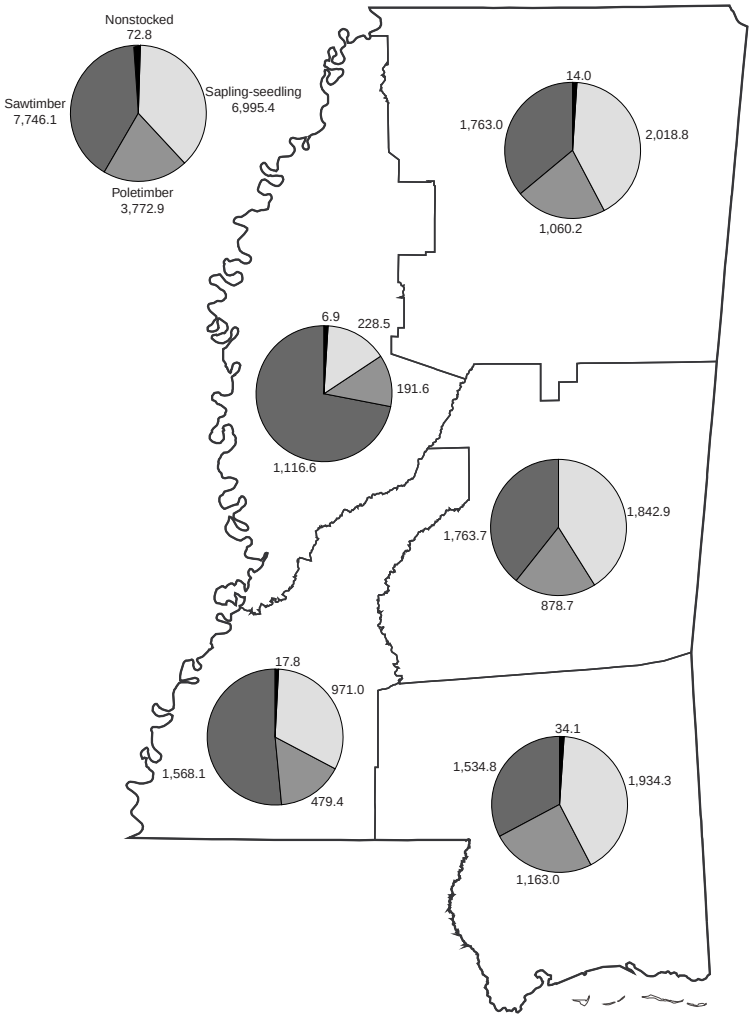

Figure 18—Proportion of timberland, in thousand acres, by stand-size class, Mississippi, 1994.

Table IX—Change in timberland by forest survey unit and stand-size class, Mississippi, 1987 to 1994

Forest survey unit	Sawtimber		Poletimber		Sapling-seedling		Nonstocked	
	Area	Change	Area	Change	Area	Change	Area	Change
	Thousand acres							
Delta	1,116.6	167.5	191.6	-147.6	228.5	124.7	6.9	6.9
Central	1,763.7	-27.9	878.7	64.9	1,842.9	361.8	0.0	-10.6
North	1,763.0	-150.7	1,060.2	-104.8	2,018.8	709.9	14.0	-0.8
South	1,534.8	-4.0	1,163.0	217.6	1,934.3	99.1	34.1	24.5
Southwest	1,568.1	6.3	479.4	1.2	971.0	252.0	17.8	10.7
All units	7,746.1	-8.8	3,772.9	31.3	6,995.4	1,547.5	72.8	30.7

Numbers in columns may not sum to totals due to rounding.

Table X—Change in timberland by ownership and stand-size classes, Mississippi, 1987 to 1994

Ownership class	Sawtimber		Poletimber		Sapling-seedling		Nonstocked	
	Area	Change	Area	Change	Area	Change	Area	Change
	Thousand acres							
National forest	757.3	-23.8	134.7	-50.4	214.6	-26.5	0.0	-10.9
Other public	561.0	79.8	88.2	-6.9	165.0	25.4	30.1	30.1
Forest industry	1,073.1	41.0	824.2	169.0	1,328.3	-163.2	12.0	-8.6
Nonindustrial private	5,354.6	-105.8	2,725.8	-80.4	5,287.6	1,712.0	30.7	20.1
All classes	7,746.1	-8.8	3,772.9	31.3	6,995.4	1,547.5	72.8	30.7

Numbers in columns may not sum to totals due to rounding.

Basal Area

Basal area for all stands in Mississippi averaged 74.4 square feet per acre in 1994. This was a 5-percent decrease over that reported for 1987, a decline from 78.6 square feet per acre. The biggest decrease was in the North unit, 13 percent (from 80.4 to 69.7 square feet per acre). Seventy-eight percent of the State's basal area was in growing-stock trees, while the remaining 22 percent was in rough-and-rotten trees. Additionally, 35 percent of total basal area was in softwoods and 65 percent was in hardwoods.

The basal area of timberland illustrates the relative amount of disturbance to forest stands in Mississippi. Publicly owned lands had much higher basal areas than private lands (both forest industry and NIPF ownerships). National forest basal area was 94.7 square feet per acre while other public timberland was 85.3 square feet per acre. Since 1987, national forest basal area increased by 3.6 square feet per acre while other public decreased by 5.2 square feet per acre. The higher basal areas on publicly owned lands were expected because there was relatively less harvest disturbance here than on private lands. The addition of 1.7 million acres of sapling-seedling-sized stands to an already high proportion of this size class in the NIPF ownership further illustrated the high degree of disturbance and early successional stage of stands in private ownership. These early successional stage stands lowered the overall average basal area on private forest lands.

Stand basal area by 2-inch diameter classes is shown in figure 19. The distribution for the State showed a pattern typical of successional or immature stands, e.g., forest stands with a high proportion of small-diameter trees. Only the Delta unit displayed a pattern more typical of maturing stands. In this instance, the amount of basal area in the mid-diameter trees was larger than in the smaller diameter trees (fig. 19). This was the only unit that did not have the reverse J-shaped distribution curve. This curve is typical of stands undergoing successional phases or entering early stages of maturity, as described by Oliver and Larson (1990).

The strong relationship to the reverse J-shaped curve was shown by amounts of basal area in the smaller trees. There was 35 square feet per acre of basal area in trees in the 2-, 4-, 6-, and 8-inch diameter classes in both the 1987 and 1994 surveys. The reverse J-shaped curve was even more obvious at the State level because of a substantial decrease in basal area in the 8-inch diameter class being offset by a gain in the 4-inch diameter class (fig. 19).

Stand basal-area relationships are also shown in tables XI through XVI. Changes in stand basal-area classes show patterns of change for the survey units, ownership, stand size, forest-type group, live-tree volume, and sawtimber volume.

There were substantial increases in timberland area in the smaller basal-area classes of 0 to 20, 21 to 40, 41 to 60, and 61 to 80 (table XI). Acreage increased by 1.7 million acres in these classes. The largest increase was in the 0- to 20-square-foot-per-acre class (703,800 acres) followed by the 21- to 40-square-foot-per-acre class (474,400 acres). Although the increases in these two basal-area classes were spread throughout all the units, the most substantial increases were in the North unit. One exception was the 21- to 40-square-foot-per-acre class in the South unit—here there was a slight decrease in timberland (table XI).

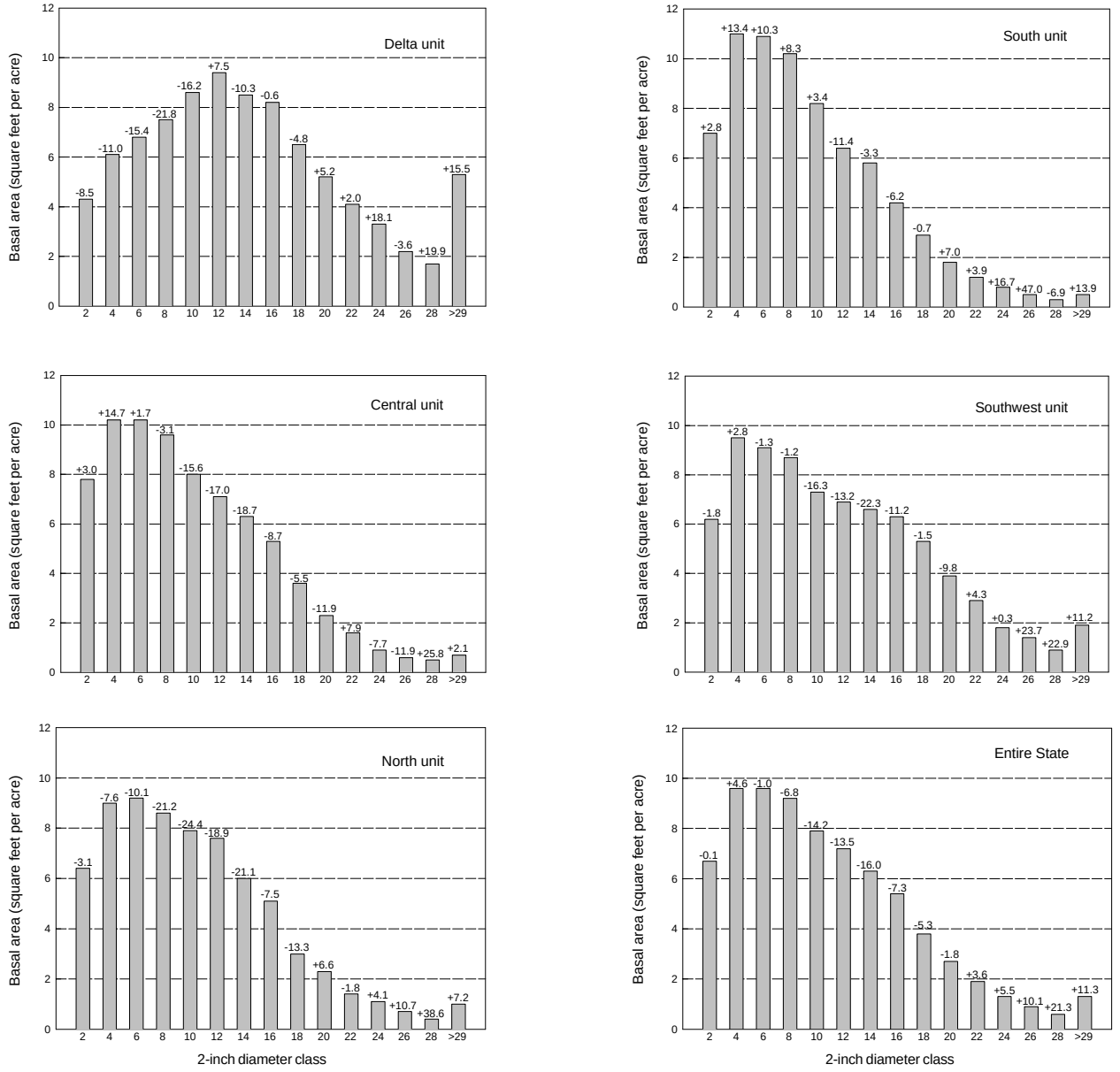

Figure 19—Basal area of all live trees by 2-inch diameter class, Mississippi, 1994. Numbers above bars are percentage changes since the 1987 survey.

Most of the increases in timberland area in the low basal-area classes were in the NIPF ownership (table XII). Substantial increases were evident in the 0- to 20-, 21- to 40-, 41- to 60-, and 61- to 80-square-foot-per-acre classes. The largest change was in the 0- to 20-square-foot-per-acre class where timberland increased by 847,700 acres. This was offset by a 212,400-acre decrease in timberland in forest industry ownership. Even with this offset (decrease), the timberland area in this class (0 to 20 square feet per acre) as a whole was 2.7 million acres.

As expected, the substantial changes in stand-size classes were in the sapling-seedling stands. The largest increases occurred in the 0 to 20, 21 to 40, 41 to 60, and 61 to 80 basal-area classes. The largest increase was in the 0- to 20-square-foot-per-acre class, 622,700 acres (table XIII). Again,

Table XI—Area of timberland by forest survey unit and basal-area class of live trees, Mississippi, 1987 and 1994

Forest survey unit	Basal-area class (*square feet per acre*)															
	>140		121–140		101–120		81–100		61–80		41–60		21–40		0–20	
	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994
	Thousand acres															
Delta	71.9	89.4	202.6	214.6	270.4	272.1	406.3	381.0	246.2	261.1	114.3	112.7	55.8	98.9	24.7	113.7
Central	308.4	306.0	408.9	380.1	608.2	646.0	743.2	764.1	658.3	717.4	529.4	589.5	340.9	464.5	499.8	617.7
North	275.8	266.7	472.1	353.5	815.2	654.2	914.1	805.7	586.5	781.7	416.7	524.8	387.4	660.2	534.6	809.2
South	257.9	297.8	267.6	403.4	459.9	563.3	706.7	740.3	772.9	753.8	693.3	647.2	503.4	472.1	667.2	788.3
Southwest	195.8	185.6	315.5	325.3	530.9	516.5	514.8	509.5	553.1	511.9	210.2	374.4	190.7	256.9	255.0	356.2
All units	1,109.9	1,145.6	1,666.7	1,676.9	2,684.6	2,652.1	3,285.1	3,200.7	2,817.0	3,025.8	1,963.9	2,248.6	1,478.2	1,952.6	1,981.3	2,685.1

Numbers in columns may not sum to totals due to rounding.

Table XII—Area of timberland by ownership and basal-area classes of live trees, Mississippi, 1987 and 1994

Ownership class	Basal-area class (*square feet per acre*)															
	>140		121–140		101–120		81–100		61–80		41–60		21–40		0-20	
	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994
	Thousand acres															
Public	226.8	251.9	237.1	296.0	376.8	364.3	396.7	348.3	293.9	232.6	138.8	137.8	124.1	111.9	140.0	208.3
Forest industry	178.4	170.0	268.1	292.0	411.8	441.3	497.3	568.7	465.4	511.9	348.6	393.7	297.9	340.4	732.0	519.6
Nonindustrial private	704.8	723.7	1,161.4	1,088.9	1,896.0	1,846.6	2,391.1	2,283.6	2,057.7	2,281.4	1,476.4	1,717.1	1,056.2	1,500.4	1,109.4	1,957.1
All classes	1,109.9	1,145.6	1,666.7	1,676.9	2,684.6	2,652.1	3,285.1	3,200.7	2,817.0	3,025.8	1,963.9	2,248.6	1,478.2	1,952.6	1,981.3	2,685.1

Numbers in columns may not sum to totals due to rounding.

Table XIII—Area of timberland by stand-size and basal-area classes of live trees, Mississippi, 1987 and 1994

Stand-size class	Basal-area class (*square feet per acre)*															
	>140		121–140		101–120		81–100		61–80		41–60		21–40		0–20	
	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994
	Thousand acres															
Sawtimber	903.7	920.2	1,357.4	1,262.0	1,829.3	1,863.2	2,003.7	1,937.2	1,221.7	1,212.3	344.4	409.6	88.7	116.2	6.0	25.3
Poletimber	200.3	225.4	280.3	385.9	785.3	635.4	1,024.6	946.2	906.9	954.2	460.6	536.9	77.6	51.9	6.1	37.1
Sapling-seedling	5.9	0.0	28.9	28.9	69.9	153.5	256.8	317.3	688.4	859.3	1,158.9	1,302.1	1,312.0	1,784.4	1,927.1	2,549.8
Nonstocked	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.1	72.8
All classes	1,109.9	1,145.6	1,666.7	1,676.9	2,684.6	2,652.1	3,285.1	3,200.7	2,817.0	3,025.8	1,963.9	2,248.6	1,478.2	1,952.6	1,981.3	2,685.1

Numbers in columns may not sum to totals due to rounding.

Table XIV—Area of timberland by forest-type group and basal-area class of live trees, Mississippi, 1987 and 1994

Forest-type group	Basal-area class (*square feet per acre*)															
	>140		121–140		101–120		81–100		61–80		41–60		21–40		0–20	
	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994
	Thousand acres															
Longleaf-slash	44.5	34.8	13.6	52.1	85.5	97.9	151.7	178.0	158.1	206.1	184.3	150.9	126.7	86.6	89.2	59.5
Loblolly-shortleaf	435.5	400.5	568.7	497.0	735.1	720.0	673.5	854.3	613.0	651.6	296.1	557.5	226.8	489.7	390.3	714.6
Oak-pine	185.5	199.3	273.7	276.0	546.1	514.2	688.3	478.7	583.2	575.1	454.8	482.6	306.5	266.7	431.3	425.1
Oak-hickory	115.1	149.0	357.0	356.6	729.2	688.0	1,117.5	1,004.6	942.8	955.3	734.2	797.3	635.3	864.8	877.1	1,018.8
Bottomland hardwoods[a]	329.2	362.0	453.7	495.2	588.7	632.0	653.9	685.1	519.9	637.8	294.4	260.2	182.9	244.9	151.2	394.2
Nontyped	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.1	72.8
All groups	1,109.9	1,145.6	1,666.7	1,676.9	2,684.6	2,652.1	3,285.1	3,200.7	2,817.0	3,025.8	1,963.9	2,248.6	1,478.2	1,952.6	1,981.3	2,685.1

Numbers in columns may not sum to totals due to rounding.

[a] Includes oak-gum-cypress and elm-ash-cottonwood forest type.

Table XV—Volume of all live trees by forest survey unit and basal-area class of live trees, Mississippi, 1987 and 1994

Forest survey unit	Basal-area class (*square feet per acre*)															
	>140		121–140		101–120		81–100		61–80		41–60		21–40		0–20	
	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994
	Million cubic feet															
Delta	259.7	331.2	528.9	493.7	549.8	603.6	640.3	630.4	292.6	321.0	96.7	71.2	21.0	38.3	1.6	10.1
Central	1,046.8	1,043.2	1,015.1	936.6	1,234.9	1,185.6	1,127.9	1,099.6	658.6	689.7	337.0	348.5	110.4	133.7	25.0	46.4
North	777.6	792.7	1,041.9	864.7	1,338.4	1,208.6	1,277.4	1,216.0	589.6	704.3	234.1	301.9	142.9	166.3	33.3	48.4
South	754.6	869.4	558.7	825.4	871.3	994.8	1,012.8	999.1	784.4	701.9	420.9	394.9	170.5	147.9	39.2	49.0
Southwest	678.7	718.1	837.4	899.1	1,125.5	1,078.1	870.9	774.7	647.4	549.8	130.1	249.2	58.5	88.5	19.4	23.6
All units	3,517.5	3,754.6	3,981.9	4,019.5	5,119.8	5,070.7	4,929.4	4,719.9	2,972.6	2,966.8	1,218.7	1,365.7	503.2	574.6	118.6	177.4

Numbers in columns may not sum to totals due to rounding.

Table XVI—Volume of all sawtimber by forest survey unit and basal-area class of live trees, Mississippi, 1987 and 1994

Forest survey unit	Basal-area class (*square feet per acre*)															
	>140		121–140		101–120		81–100		61–80		41–60		21–40		0–20	
	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994	1987	1994
	Million board feet[a]															
Delta	950.8	1,333.8	1,917.1	1,681.4	1,860.5	2,235.3	2,042.6	2,165.8	794.4	1,135.9	262.4	177.0	48.1	98.9	1.4	26.3
Central	4,499.1	4,476.3	3,843.1	3,410.7	4,586.3	4,129.7	3,999.9	3,857.7	2,085.9	2,145.6	809.8	931.7	286.4	328.5	52.9	121.5
North	2,512.2	2,789.6	3,529.9	2,949.1	4,206.8	4,005.5	3,903.4	3,646.8	1,672.5	1,725.9	478.6	702.2	315.0	315.6	54.5	81.9
South	2,500.2	2,871.7	1,780.6	2,549.0	2,959.5	3,538.5	3,395.9	3,161.8	2,420.8	2,204.4	1,210.0	985.1	396.3	355.5	87.3	93.5
Southwest	2,933.4	3,179.2	3,542.3	3,779.4	4,488.5	4,364.6	3,255.7	2,755.4	2,257.0	1,774.6	339.3	805.5	100.7	270.7	51.3	28.2
All units	13,395.7	14,650.6	14,613.0	14,369.6	18,101.6	18,273.6	16,597.5	15,587.5	9,230.5	8,986.4	3,100.2	3,601.5	1,146.5	1,369.2	247.4	351.4

Numbers in columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

most of this change was due to the addition of new land into the timberland base.

Most of the trend dynamics in basal-area classes were in the loblolly-shortleaf pine forest-type group, but there were some noteworthy changes in the other groups with the exception of the longleaf-slash pine (table XIV). The loblolly-shortleaf pine forest-type group had large increases in the 0 to 20, 21 to 40, 41 to 60, and 81 to 100 basal-area classes totaling 1.0 million acres. This was mostly a result of the establishment of loblolly-pine stands, either naturally or by planting. There was little change between 1987 and 1994 in the amount of timberland area in the higher basal-area classes for this forest-type group. The oak-pine forest-type group had a 209,600-acre decrease in the 81- to 100-square-foot-per-acre basal-area class. However, this was offset in this class by a 180,800-acre gain in the loblolly-shortleaf pine forest-type group. The oak-hickory forest-type group had a 360,600-acre gain in the 0- to 20- and 21- to 40-square-foot-per-acre basal-area class while the oak-gum-cypress group increased 223,700 acres in the 0- to 20-square-foot-per-acre class and 117,900 acres in the 61- to 80-square-foot-per-acre basal-area class.

Live tree and sawtimber volume trends are shown in tables XV and XVI, respectively. The largest changes in live-tree volume since 1987 were a 147.0-million-cubic-foot increase in the 41- to 60-square-foot-per-acre class, a 209.5-million-cubic-foot decrease in the 81- to 100-square-foot-per-acre class, and a 237.1-million-cubic-foot increase in the class with more than 140 square feet per acre (table XV). The largest change since 1987, in any survey unit, was a 266.7-million-cubic-foot increase in the 121- to 140-square-foot-per-acre class in the South unit (table XV). Sawtimber volume changes were substantial in only two basal-area classes. Volume increased by 1,254.9 million board feet in the more than 140-square-foot-per-acre class. In contrast, volume decreased by 1,010.0 million board feet in the 81- to 100-square-foot-per-acre class. The remaining classes had changes of less than 500.0 million board feet since 1987 (table (XVI).

Species Distribution

The spatial distribution of five important Mississippi softwoods is illustrated in figure 20. The maps are intended to show the distribution of species where their concentrations were above a threshold of minimum volume. For softwoods, that threshold was 5 million cubic feet per county; for hardwoods, it was 500,000 cubic feet per county. For example, if there was 1 million cubic feet of white oak volume in Hinds County, then two dots were placed randomly in the county. If there were only 400,000 cubic feet of white oak volume in Hinds County, a dot

Figure 20—Distribution of five important softwoods, Mississippi, 1994. Each dot represents 5 million cubic feet.

would not be placed in the county. To smooth out the distributions and reduce clutter, county lines are not shown in the maps. The exact locations of dots are intended only as approximations inside county boundaries, but are accurate enough to depict spatial distribution patterns above the county level of scale, such as regional and State levels of scale.

Loblolly pine had the widest ecological amplitude of all softwood species and had high volume and importance in all regions of the State except for the Delta. Shortleaf pine was also as widespread as loblolly pine, but concentrations were not as high. It, too, was absent from the Delta, and was also absent from the lower gulf coast region. Longleaf pine and slash pine ranges overlapped. They were confined to the lower southeast corner of Mississippi where sites with deep, sandy soils favor these two species.

The distributions of seven important hardwoods are shown in figure 21. Sweetgum had the widest ecological amplitude of the hardwood species. It was present in all forested regions of the State, from upland sites to bottomland sites. Blackgum also was present across the State but was absent in the Delta region. It had a particularly high concentration in the extreme southern tip of Mississippi. White oak, southern red oak, cherrybark oak, water oak, and willow oak all expressed varying concentrations of occurrence across the State. White oak was absent from the Delta region and the extreme southern end of Mississippi, as was southern red oak. Cherrybark oak was absent from the extreme southern end of the State, but was present in the Delta region; there was a high concentration of this species in the southwestern area of Mississippi. Water oak and willow oak occurred across the State, with an obvious much higher concentration of water oak. Willow oak prefers and tolerates

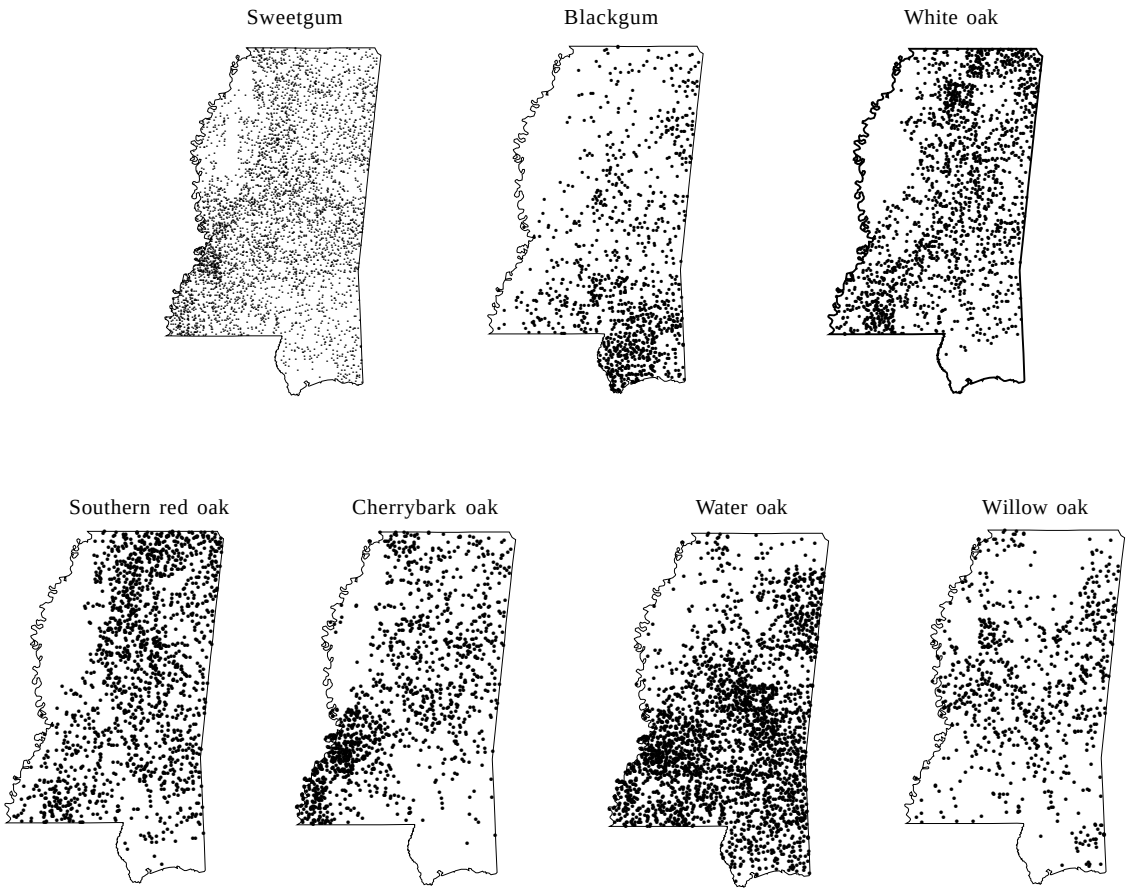

Figure 21—Seven important hardwoods, Mississippi, 1994. Each dot represents 500,000 cubic feet.

wetter sites than water oak, but both grow on both lowland and upland sites.

Change in Number of Trees

Another way to look at trends in stand structure is to track the number of trees by diameter classes over time. Figure 22 illustrates the change in density (number of trees) of both softwoods and hardwoods by 2-inch diameter classes.

As discussed previously with volume and basal area, softwoods showed increases in the 2-, 4-, 6-, and 8-inch diameter classes, decreases in the mid-diameter ranges (10-, 12- 14-, 16-, and 18-inch diameter classes), and increases in all the larger diameters. The change was not nearly as high in hardwoods, except for the higher diameter classes. Those concerned with the hardwood resource might conclude that harvesting rotations will eventually reduce the number of hardwoods, especially if managers continue to favor pine over hardwood. This appears to be what is happening as evidenced by reductions in the smaller (regeneration) diameter classes.

There also has been some concern by hardwood industry interests that hardwood stands are being eliminated and replaced with pine stands. Figures 23 and 24 illustrate the changes in stand proportions between 1987 and 1994. Figure 23 includes bottomland hardwoods to show their effect on this change in the higher percentile ranges of hardwoods. Figure 24 includes only upland sites—the areas where conversion of hardwoods to pine was most likely to occur.

Since 1987, there has been a substantial increase in the amount of timberland area with high proportions of hardwoods. Stands with more than 90 percent of basal area in hardwoods species have increased by 449,600 acres (fig. 24). Other noteworthy changes were in stands with at least 50 but less than 60 percent in hardwoods. Here, timberland area decreased by 184,700 acres.

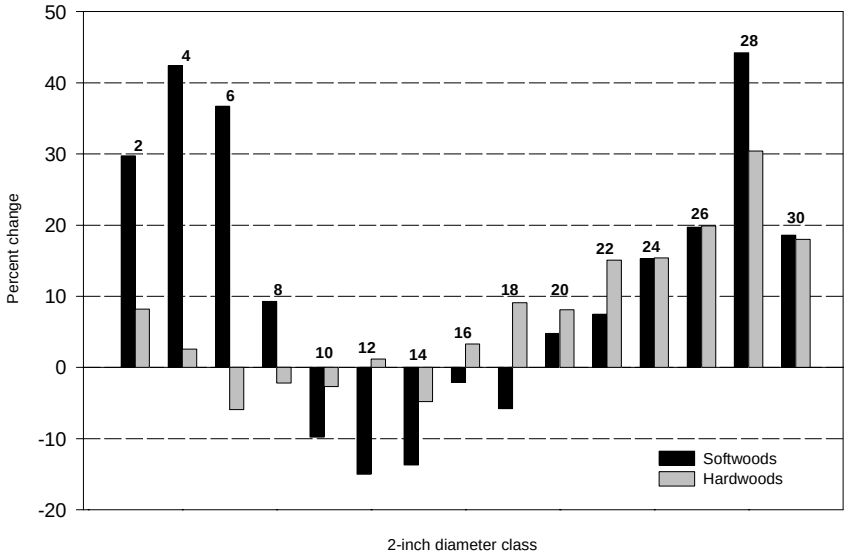

Figure 22—Percentage change in number of live trees between 1987 and 1994, Mississippi.

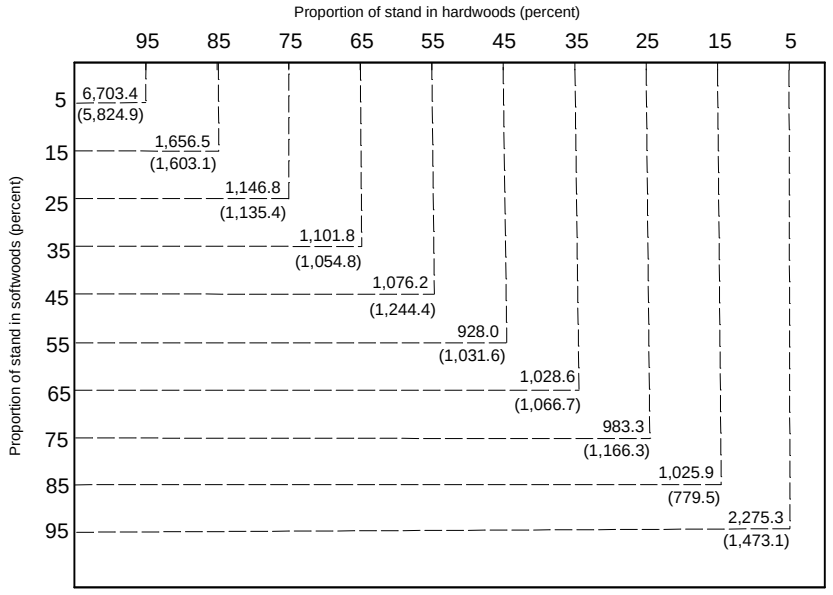

Figure 23—Area of timberland by proportion of stand in softwoods and hardwoods, Mississippi, 1994. The percentage values are the midpoints of the deciles. Thus, 85 percent includes values 80 percent or greater but less than 90 percent. Area is in thousand acres; the acreage enclosed in parentheses is from the 1987 survey. Proportions are based on basal area, and only stands with trees 1.0 inch or larger in diameter at breast height are included.

There were substantial increases in timberland area with high proportions in softwood basal area. Since 1987, stands composed of at least 80 but less than 90 percent softwoods increased by 237,000 acres. An even larger increase was in stands composed of 90 percent or more softwoods. Here, timberland area went from 1.4 million acres in 1987 to 2.2million acres in 1994, a 796,900-acre increase. The increase of stands that had high proportions in softwoods has more than offset the increase in stands with high proportions in hardwoods.

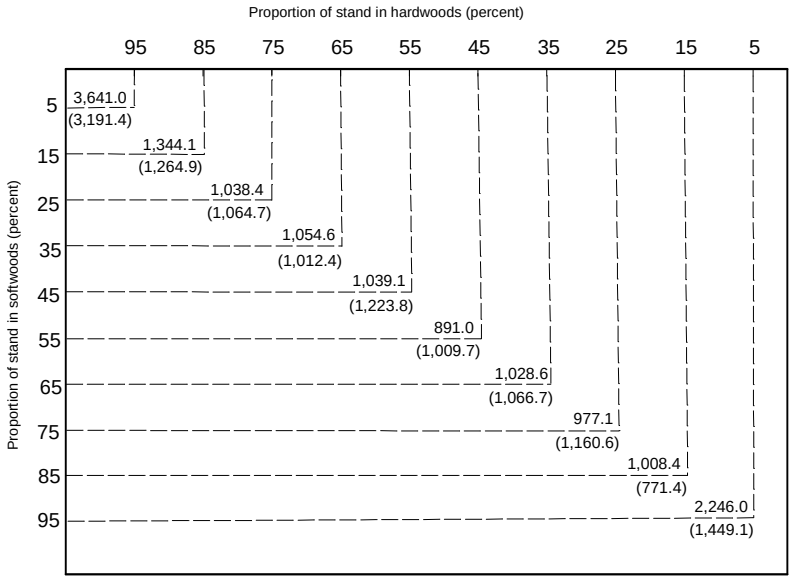

Figure 24—Area of upland timberland by proportion of stand in softwoods and hardwoods, Mississippi, 1994. The percentage values are the midpoints of the deciles. Thus, 85 percent includes values 80 percent or greater but less than 90 percent. Area is in thousand acres; the acreage enclosed in parentheses is from the 1987 survey. Proportions are based on basal area, and only upland stands with trees 1.0 inch or larger in diameter at breast height are included.

Species Importance

Tables XVIIa through XVIIf show species importance for the State as a whole and for each survey unit. In this case, species importance is based on the aggregated volume of each tree species greater than 1.0 inch d.b.h. Note that this includes sapling trees (trees 1.0 but less than 5.0 inches d.b.h.), which normally are left out of commercial volume estimates.

Loblolly pine was the dominant softwood and the dominant species in Mississippi. There were 6,983.9 million cubic feet in loblolly pine, 26 percent of total volume of all species. Loblolly was a strong dominant containing 4,257.5 million cubic feet more than its closest ranking competitor—sweetgum with 2,726.4 million cubic feet, 10 percent of total volume. Shortleaf pine and water oak were closely ranked at the third and fourth positions with 1,664.6 and 1,615.2 million cubic feet, respectively. The next species ranking in the top 10 were white oak, slash pine, southern red oak, blackgum, yellow-poplar, and cherrybark oak. Together, the top 10 species made up 17,830.8 million cubic feet, or 66 percent of total volume in the State.

Loblolly pine was the leading dominant in all the survey units with the exception of the Delta unit. In the four other survey units, it dominated by approximately twice the volume (or more) of its nearest competitor. Sweetgum ranked second in the Central, North, and Southwest units. In the South unit, slash pine and longleaf pine ranked second and third. This is the region of Mississippi where these two species are most important economically but, even here, loblolly pine outranked them by a substantial margin. Together, the volumes of slash pine and longleaf pine did not equal loblolly pine, 1,480.5 versus 1,553.6 million cubic feet, respectively.

In the only survey unit (Delta) where loblolly pine was not dominant, sweetgum was the leading species, but here, sweetgum was not as strong a dominant as loblolly pine in the other units. For example, sweetgum accounted for only 15 percent of the volume in the Delta unit, whereas loblolly pine was 39 percent of the volume in the Central unit.

Growth, Removals, and Mortality

The forest survey reported three components of inventory change: growth, removals, and mortality; all reported in volume. Complex interactions among these components resulted in an increase, decrease, or no change of inventory volume between survey measurements. Because of the dynamic nature of these components, estimates were given as the periodic annual average, i.e., the average over the survey period and not over the life of the trees being sampled.

Table XVIIa—Ranking of tree species[a] (by volume) for the State, Mississippi, 1994

Species	Volume[b]	Species	Volume[b]
	State		
Loblolly pine	6,983.9	River birch	46.4
Sweetgum	2,726.4	Bitternut hickory	40.2
Shortleaf pine	1,664.6	Northern red oak	36.3
Water oak	1,615.2	Water-elm	32.0
White oak	1,001.9	Red mulberry	29.8
Slash pine	928.5	Black locust	25.3
Southern red oak	871.9	Shellbark hickory	24.2
Blackgum	692.4	Sparkleberry	20.4
Yellow-poplar	679.8	White basswood	17.4
Cherrybark oak	666.2	Redbay	16.8
Longleaf pine	635.3	Cedar elm	16.6
Red maple	568.0	Black walnut	15.8
Post oak	533.8	Honey locust	15.8
Willow oak	419.2	Sugar maple	15.5
Sugarberry	404.7	Other species[c]	15.0
Pignut hickory	388.8	Florida maple	14.5
Green ash	381.4	Osage-orange	13.2
Sweetbay	369.8	Chestnut oak	13.1
Flowering dogwood	333.0	Bigleaf magnolia	12.5
Winged elm	275.0	Hawthorns	11.5
Baldcypress	247.4	Silver maple	11.1
Mockernut hickory	245.8	Eastern redbud	10.5
Black cherry	202.5	Cucumbertree	10.2
Overcup oak	200.7	Chinkapin oak	9.8
American sycamore	197.2	Nutmeg hickory	7.2
Swamp tupelo	196.1	Chinese tallowtree	6.3
American beech	195.8	Durand oak	6.2
American hornbeam	194.2	Live oak	6.2
American elm	193.4	American basswood	5.1
Spruce pine	164.6	Plums and cherries[d]	5.1
Willow	159.2	Turkey oak	4.9
Laurel oak	157.2	Hickories	3.3
Eastern redcedar	153.9	White mulberry	2.9
Nuttall oak	150.3	Water locust	2.9
Black oak	149.9	Chinaberry	2.7
Swamp chestnut oak	142.9	Bluejack oak	2.6
Water hickory	129.4	Hackberry	2.5
Shumard oak	123.6	Apples	2.2
Boxelder	113.4	Buckeye	1.8
Cottonwood	111.1	Ailanthus	1.6
Water tupelo	108.8	Tung-oil tree	1.6
Eastern hophornbeam	103.7	Chinkapins	1.4
Sourwood	102.4	Atlantic white-cedar	1.3
White ash	96.1	Serviceberries	1.2
Common persimmon	95.5	Catalpa	1.0
Shagbark hickory	90.6	Bumelia	0.9
Pecan	87.0	Allegheny chinkapin	0.7
Sassafras	71.5	Royal Paulownia	0.7
Slippery elm	63.1	Pin oak	0.5
Scarlet oak	57.7	Ohio buckeye	0.5
Southern magnolia	56.3	Virginia pine	[e]
American holly	51.4	Southern redcedar	[e]
Blackjack oak	51.1		

[a] Scientific names can be cross referenced in species list in appendix.

[b] Values are net cubic-foot volume in million cubic feet for all live trees ≥1.0 inch in diameter at breast height.

[c] Other species includes noncommercial and unidentified species.

[d] Other than black cherry.

[e] Volume > 0.0 but < 0.1 million cubic feet.

Table XVIIb—Ranking of tree species[a] (by volume) for the Delta forest survey unit, Mississippi, 1994

Species	Volume[b]	Species	Volume[b]
	Delta unit		
Sweetgum	398.7	Black cherry	14.0
Sugarberry	261.8	Swamp chestnut oak	12.2
Green ash	166.3	Mockernut hickory	12.2
Nuttall oak	121.2	Blackgum	10.4
Water oak	114.3	White basswood	9.6
Willow oak	113.6	Water-elm	8.4
Overcup oak	102.0	Red mulberry	7.9
Water hickory	98.2	Silver maple	7.9
Cherrybark oak	77.9	Black oak	7.2
Willow	77.2	Post oak	6.6
Baldcypress	74.5	Shagbark hickory	6.2
American elm	74.3	Honey locust	6.0
Yellow-poplar	72.1	Chinkapin oak	5.5
Cottonwood	66.6	Black walnut	4.8
American sycamore	65.5	Black locust	4.6
Boxelder	59.9	Cucumbertree	4.0
Water tupelo	57.4	Florida maple	3.3
Pignut hickory	55.4	Chestnut oak	3.3
Pecan	52.4	Eastern redbud	2.8
American beech	48.1	Northern red oak	2.8
White oak	45.9	Bigleaf magnolia	2.7
Loblolly pine	36.1	Osage-orange	2.4
White ash	32.8	Water locust	1.9
Shumard oak	30.2	Scarlet oak	1.8
Southern red oak	30.2	Other species[c]	1.5
Common persimmon	29.3	Plums and cherries[d]	1.1
Eastern hophornbeam	27.1	American basswood	0.9
American hornbeam	25.0	Hawthorns	0.8
Flowering dogwood	23.5	Laurel oak	0.7
Sassafras	22.7	Shellbark hickory	0.6
Bitternut hickory	19.9	American holly	0.5
Slippery elm	18.6	Sourwood	0.5
Winged elm	17.1	Blackjack oak	0.4
Eastern redcedar	16.4	Hackberry	0.4
Red maple	15.9	Bumelia	0.3
Shortleaf pine	15.8	Ohio buckeye	0.1
Cedar elm	15.0	Chinaberry	0.1
Sugar maple	14.2	Sparkleberry	[e]

[a] Scientific names can be cross referenced in species list in appendix.

[b] Values are net cubic-foot volume in million cubic feet for all live trees ≥1.0 inch in diameter at breast height.

[c] Other species includes noncommercial and unidentified species.

[d] Other than black cherry.

[e] Volume >0.0 but <0.1 million cubic feet.

Table XVIIc—Ranking of tree species[a] (by volume) for the Central forest survey unit, Mississippi, 1994

Species	Volume[b]	Species	Volume[b]
	Central unit		
Loblolly pine	2,576.3	Blackjack oak	8.8
Sweetgum	692.2	White ash	7.7
Shortleaf pine	503.2	Red mulberry	6.6
Water oak	454.9	Boxelder	5.3
White oak	247.5	Durand oak	4.6
Southern red oak	203.8	Scarlet oak	4.2
Red maple	170.6	Hawthorns	4.2
Yellow-poplar	153.7	Slippery elm	4.0
Post oak	140.4	River birch	4.0
Blackgum	127.9	Northern red oak	3.5
Cherrybark oak	122.7	Water hickory	2.9
Willow oak	116.2	Cottonwood	2.7
Pignut hickory	94.2	Honey locust	2.7
Spruce pine	81.9	Nutmeg hickory	2.6
Flowering dogwood	65.1	Eastern redbud	2.5
Mockernut hickory	62.3	Southern magnolia	2.2
Winged elm	49.7	Sparkleberry	2.0
Green ash	45.5	Black locust	1.9
American hornbeam	45.3	Buckeye	1.8
Swamp chestnut oak	36.5	Chinkapin oak	1.6
Sweetbay	35.0	Other species[c]	1.2
Black cherry	34.8	Cedar elm	1.1
Sourwood	33.5	Bigleaf magnolia	1.1
Longleaf pine	33.5	Osage-orange	0.9
American beech	33.1	Plums and cherries[d]	0.9
Laurel oak	32.2	Black walnut	0.8
Shagbark hickory	32.1	Pecan	0.7
Slash pine	31.4	Allegheny chinkapin	0.5
Overcup oak	29.4	Cucumbertree	0.5
American elm	28.0	Sugar maple	0.4
Shumard oak	27.4	Ohio buckeye	0.4
Eastern redcedar	26.6	Silver maple	0.3
Black oak	21.8	Hackberry	0.3
Common persimmon	21.2	American basswood	0.2
Swamp tupelo	19.1	Water-elm	0.2
Sugarberry	19.1	Bluejack oak	0.1
Sassafras	18.2	Redbay	0.1
Water tupelo	13.6	Turkey oak	0.1
American sycamore	13.4	Chinese tallowtree	0.1
American holly	11.2	Bumelia	[e]
Shellbark hickory	10.5	Florida maple	[e]
Baldcypress	10.3	White basswood	[e]
Willow	10.2	Chinaberry	[e]
Eastern hophornbeam	10.1	Serviceberries	[e]
Nuttall oak	9.8	Chinkapins	[e]

[a] Scientific names can be cross referenced in species list in appendix.

[b] Values are net cubic-foot volume in million cubic feet for all live trees ≥1.0 inch in diameter at breast height.

[c] Other species includes noncommercial and unidentified species.

[d] Other than black cherry.

[e] Volume >0.0 but <0.1 million cubic feet.

Table XVIId—Ranking of tree species[a] (by volume) for the North forest survey unit, Mississippi, 1994

Species	Volume[b]	Species	Volume[b]
		North unit	
Loblolly pine	1,290.3	Slippery elm	13.5
Sweetgum	752.8	Sassafras	13.2
Shortleaf pine	631.4	Sweetbay	13.2
White oak	431.5	Black locust	10.9
Southern red oak	396.7	Shellbark hickory	9.3
Post oak	247.3	Chestnut oak	9.2
Water oak	238.2	Osage-orange	8.5
Cherrybark oak	192.9	Bitternut hickory	7.6
Red maple	180.3	Nuttall oak	7.5
Yellow-poplar	148.6	Black walnut	7.0
Winged elm	136.6	Red mulberry	6.5
Pignut hickory	135.6	Florida maple	6.1
Mockernut hickory	117.2	Water hickory	5.6
Flowering dogwood	110.4	Swamp tupelo	4.3
Black oak	107.4	Nutmeg hickory	4.0
Blackgum	103.2	Slash pine	3.9
Willow oak	98.9	Hickories	3.3
Eastern redcedar	90.9	Sparkleberry	2.3
Green ash	81.0	Pecan	2.2
Black cherry	53.2	Silver maple	2.1
Shagbark hickory	51.7	Cucumbertree	2.0
American sycamore	51.2	Hackberry	1.8
Shumard oak	48.9	Hawthorns	1.8
Overcup oak	43.3	Eastern redbud	1.8
Scarlet oak	43.2	Ailanthus	1.6
American elm	40.6	Durand oak	1.6
Willow	39.1	Cottonwood	1.6
Sugarberry	35.3	Bigleaf magnolia	1.3
River birch	31.4	Catalpa	1.0
American beech	31.4	Plums and cherries[c]	1.0
Sourwood	30.6	White basswood	0.8
Northern red oak	27.7	Chinkapin oak	0.8
American hornbeam	27.3	Royal Paulownia	0.7
White ash	26.2	American holly	0.6
Blackjack oak	25.8	Honey locust	0.6
Common persimmon	25.5	Pin oak	0.5
Eastern hophornbeam	25.2	American basswood	0.3
Swamp chestnut oak	21.6	Allegheny chinkapin	0.2
Baldcypress	21.6	Bumelia	0.1
Water-elm	17.9	Other species[d]	0.1
Boxelder	16.2	White mulberry	0.1
Laurel oak	15.3	Buckeye	0.1
Water tupelo	14.4	Serviceberries	0.1

[a] Scientific names can be cross referenced in species list in appendix.

[b] Values are net cubic-foot volume in million cubic feet for all live trees ≥1.0 inch in diameter at breast height.

[c] Other than black cherry.

[d] Other species includes noncommercial and unidentified species.

Table XVIIe—Ranking of tree species[a] (by volume) for the South forest survey unit, Mississippi, 1994

Species	Volume[b]	Species	Volume[b]
	South unit		
Loblolly pine	1,553.6	Winged elm	6.4
Slash pine	886.3	Live oak	6.0
Longleaf pine	594.2	Scarlet oak	5.6
Water oak	414.9	American sycamore	4.9
Blackgum	382.3	Shumard oak	4.8
Sweetbay	311.6	Turkey oak	4.8
Sweetgum	278.7	Pecan	4.2
Shortleaf pine	222.8	Hawthorns	3.7
Yellow-poplar	173.8	Slippery elm	3.5
Red maple	157.8	Black oak	3.4
Swamp tupelo	152.9	Sugarberry	3.3
Southern red oak	122.9	White ash	3.2
Laurel oak	90.6	Chinese tallowtree	2.9
Post oak	83.7	Bluejack oak	2.5
White oak	80.3	Eastern redcedar	2.3
Flowering dogwood	68.3	Red mulberry	1.9
Baldcypress	54.4	Bitternut hickory	1.7
Spruce pine	54.1	Tung-oil tree	1.6
Willow oak	48.2	Eastern hophornbeam	1.5
Black cherry	47.8	Chinkapins	1.4
Swamp chestnut oak	35.7	Atlantic white-cedar	1.3
American hornbeam	33.0	Bigleaf magnolia	1.2
American holly	32.5	Cucumbertree	1.2
Mockernut hickory	27.8	Plums and cherries[d]	1.2
Green ash	24.8	Apples	1.1
Southern magnolia	24.7	Serviceberries	1.1
Cherrybark oak	24.4	Shellbark hickory	1.0
American beech	21.3	Chinaberry	0.9
Water tupelo	16.2	Silver maple	0.7
Redbay	16.1	Nuttall oak	0.7
Pignut hickory	15.6	Shagbark hickory	0.6
Sourwood	15.3	Sugar maple	0.5
Overcup oak	15.0	Boxelder	0.4
Blackjack oak	13.8	Chestnut oak	0.3
Sparkleberry	12.7	Black walnut	0.3
American elm	9.9	Northern red oak	0.2
Other species[c]	9.2	Florida maple	[e]
Common persimmon	9.0	Eastern redbud	[e]
River birch	8.6	Allegheny chinkapin	[e]
Willow	8.0	White mulberry	[e]
Water hickory	7.3	American basswood	[e]
Sassafras	7.2		

[a] Scientific names can be cross referenced in species list in appendix.

[b] Values are net cubic-foot volume in million cubic feet for all live trees ≥ 1.0 inch in diameter at breast height.

[c] Other species includes noncommercial and unidentified species.

[d] Other than black cherry.

[e] Volume > 0.0 but < 0.1 million cubic feet.

Table XVIIf—Ranking of tree species[a] (by volume) for the Southwest forest survey unit, Mississippi, 1994

Species	Volume[b]	Species	Volume[b]
	Southwest unit		
Loblolly pine	1,527.6	Sweetbay	10.0
Sweetgum	603.9	Black locust	7.9
Water oak	392.9	Longleaf pine	7.6
Shortleaf pine	291.3	Water tupelo	7.2
Cherrybark oak	248.2	White basswood	7.0
White oak	196.8	Red mulberry	6.9
Yellow-poplar	131.6	Slash pine	6.8
Southern red oak	118.3	Bitternut hickory	6.8
Pignut hickory	88.0	American holly	6.5
Baldcypress	86.6	Honey locust	6.4
Sugarberry	85.1	Bigleaf magnolia	6.2
Blackgum	68.6	Water-elm	5.5
Flowering dogwood	65.7	Florida maple	5.0
Winged elm	65.2	American basswood	3.7
Green ash	63.7	Eastern redbud	3.4
American hornbeam	63.6	Chinese tallowtree	3.3
American sycamore	62.2	Sparkleberry	3.3
American beech	61.9	Other species[c]	3.3
Post oak	55.8	Scarlet oak	2.9
Black cherry	52.7	White mulberry	2.8
Red maple	43.4	Black walnut	2.8
Willow oak	42.3	Shellbark hickory	2.8
American elm	40.6	Cucumbertree	2.6
Cottonwood	40.3	River birch	2.4
Eastern hophornbeam	39.7	Blackjack oak	2.2
Swamp chestnut oak	36.9	Northern red oak	2.2
Boxelder	31.6	Chinkapin oak	2.0
Southern magnolia	29.4	Chinaberry	1.7
Spruce pine	28.7	Osage-orange	1.3
Pecan	27.5	Apples	1.1
Mockernut hickory	26.3	Hawthorns	1.0
White ash	26.1	Water locust	0.9
Willow	24.6	Plums and cherries[d]	0.9
Slippery elm	23.6	Nutmeg hickory	0.7
Sourwood	22.5	Redbay	0.5
Swamp tupelo	19.7	Cedar elm	0.5
Laurel oak	18.4	Bumelia	0.4
Eastern redcedar	17.6	Sugar maple	0.3
Water hickory	15.4	Chestnut oak	0.3
Shumard oak	12.4	Live oak	0.2
Nuttall oak	11.1	Silver maple	0.1
Overcup oak	11.0	Virginia pine	[e]
Common persimmon	10.5	Southern redcedar	[e]
Black oak	10.1	Chinkapins	[e]
Sassafras	10.1		

[a] Scientific names can be cross referenced in species list in appendix.

[b] Values are net cubic-foot volume in million cubic feet for all live trees ≥1.0 inch in diameter at breast height.

[c] Other species includes noncommercial and unidentified species.

[d] Other than black cherry.

[e] Volume > 0.0 but < 0.1 million cubic feet.

One problem with large forest surveys, such as those conducted in the Southern States, is in getting the volume of the first survey, plus net growth minus harvest since the first survey, to equal the inventory of the second survey. A portion of this problem was solved by using a plot-growth method described by Van Deusen and others (1986). However, this method resolved only the growth imbalance problem inherent with variable-radius plot sampling (see Inventory Methods in the appendix).

The second portion of the growth balance problem deals with the assignment of the area weighting factor (commonly called the expansion factor). This expansion factor is the timberland area each 3- by 3-mile sample plot represents. Multiplying the per-acre estimate of volume (or growth, removals, mortality, or other plot parameters) on the plot by the expansion factor expands that volume to the number of acres represented by the plot. A problem occurs when the plot population (number of forested plots in the survey sample) of the time 1 survey differs substantially from the plot population of the time 2 survey. This is usually a result of plots diverting (going from forest to nonforest) or reverting (going from nonforest to forest). Once this occurs, the difference between expansion factors used for time 1 and time 2 estimates increases. Therefore, since these expansion factors (named the resurveyed expansion factor for time 1 growth, removals, and mortality, and expansion factor for time 2 volume) differ widely (degree of which depends on how different the plot populations are), it is not possible to balance precisely the growth of the time 1 inventory with the time 2 inventory. In such instances, the most accurate estimate of growth between the time 1 and time 2 surveys may be the difference in volume between the measurement periods. Unfortunately, this approach does not readily lend itself to poststrata analysis of key inventory components such as ownership, stand origin, individual trees, species, etc.

This imbalance phenomenon occurred in the 1994 survey of Mississippi because of the unusually large increase in timberland area since 1987. A total of 290 3- by 3-mile sample plots were added to the timberland plot population. This made it virtually impossible to balance the volume plus growth of the 1987 inventory with the 1994 inventory. Currently, there is not a solution for this type of imbalance problem. Manipulating expansion factors (either area weighting or trees-per-acre weighting) to solve the growth imbalance problem when plot populations differ substantially would create imbalance problems when the plot populations do not change substantially between surveys.

The expansion factor problem occurs regardless of the plot design used, be it variable radius or fixed area.

Even though there was an imbalance between growth and the new volume estimate, the difference was relatively small. The average elapsed time between the 1987 and 1994 surveys was 6.95 years. Therefore, the time 2 volume by growth was computed as:

time 2 volume = volume at time 1
+ (net growth
x elapsed time)
- (removals
x elapsed time) .

This was compared with the volume estimate for time 2. For example, softwoods live-tree volume was computed as:

time 2 volume = 9,473.7
+ (638.0 x 6.95)
- (715.8 x 6.95)
= 8,932.9 million cubic feet .

Comparing this volume (computed through growth) with the time 2 volume (9,362.5 million cubic feet) showed a 429.6-million-cubic-foot imbalance (4.59 percent). Considering the difference in plot population sizes between 1987 and 1994, this was a very reasonable imbalance. For hard-woods, the imbalance was 4.70 percent and for softwoods and hard-woods combined, the imbalance was 4.66 percent. The size of the sawtimber imbalance was similar—3.55, 4.46, and 4.0 percent for softwoods, hardwoods, and soft-wood and hardwoods combined, respectively.

The growth estimates did provide valuable information on how timberland, growth, removals, and mortality performed in relation to the timberland area base at time 1. This growth, removals, and mortality information, combined with reversion and diversion information at time 2, provided valuable insights as to the status of Mississippi's forest resources.

Softwoods

Softwood live-tree gross growth was 722.7 million cubic feet per year for the survey period between 1987 and 1994 (see appendix for definitions of gross growth, net growth, and net change); net growth was 638.0 million cubic feet per year. These estimates are substantial improvements over the 1977 to 1987 live-tree growth estimates, where gross growth averaged 573.5 million cubic feet per year and net growth averaged 485.6 million cubic feet per year. Most of

the net growth during the 1994 survey period came from the Central and South units. These two units accounted for 62 percent of the softwood net growth in Mississippi (table XVIII).

Removals for the survey period averaged 715.8 million cubic feet per year. This was a 230.2-million-cubic-foot-per-year increase over that of the 1977 to 1987 survey period. Even with the large increase in net growth, the high amount of softwood removals for the survey period (715.8 million cubic feet) resulted in a net change of minus 77.8 million cubic feet per year, a negative drain on the resource. The trend in net change was not an improvement over the 0.0 net change for the 1977 to 1987 period. Overall, the ratio between removals and growth was almost in balance, but removals were slightly higher than net growth. The resulting removal-to-growth ratio for the survey period was 1.12 to 1.0. For the 1977 to 1987 survey period, the ratio between removals and growth was in balance, 1.0 to 1.0. Since the previous survey period, the balance between growth and removals has slightly worsened.

Growth-to-removal ratios and removal-to-growth ratios were used to illustrate the relationship between growth and removals. If growth was larger than removals, the ratio was shown as growth-to-removal. If removals exceeded growth,

Table XVIII—Components of annual change in the volume of live trees by forest survey unit and species group, Mississippi, 1987 to 1994

Forest survey unit	Species group	Growth component							
		Survivor growth[a]	Ingrowth[b]	Growth on removals	Growth on mortality	Mortality	Timberland removals	Land-clearing removals	Net change[c]
		Million cubic feet							
Delta									
	Softwood	3.3	1.6	1.7	0.2	1.3	12.2	0.0	-6.7
	Hardwood	73.3	6.6	7.3	6.0	36.6	55.7	2.7	-1.8
	Total	76.6	8.2	9.0	6.3	38.0	67.9	2.7	-8.5
Central									
	Softwood	143.6	35.4	38.9	5.2	22.8	217.1	3.8	-20.4
	Hardwood	94.6	19.6	15.6	4.0	24.3	122.8	5.6	-18.9
	Total	238.2	55.1	54.5	9.3	47.1	339.8	9.4	-39.3
North									
	Softwood	96.1	28.2	30.3	4.4	23.7	180.4	5.3	-50.4
	Hardwood	135.2	18.7	18.3	4.4	35.6	139.6	12.8	-11.4
	Total	231.4	46.9	48.6	8.8	59.3	320.1	18.0	-61.8
South									
	Softwood	132.4	45.9	30.1	4.8	17.2	155.9	8.3	31.8
	Hardwood	63.7	15.2	9.3	2.8	20.2	67.5	3.5	-0.1
	Total	196.1	61.1	39.5	7.6	37.4	223.4	11.8	31.6
Southwest									
	Softwood	78.0	15.2	23.2	4.0	19.7	130.8	1.9	-32.1
	Hardwood	83.7	14.4	10.9	3.9	27.9	80.2	5.1	-0.4
	Total	161.7	29.6	34.1	7.9	47.7	211.0	7.0	-32.4
All units									
	Softwood	453.4	126.4	124.3	18.6	84.7	696.5	19.3	-77.8
	Hardwood	450.5	74.5	61.3	21.2	144.7	465.7	29.6	-32.6
	Total	903.9	200.8	185.6	39.8	229.4	1,162.2	48.9	-110.4

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes nongrowth trees.

[b] Includes ongrowth trees.

[c] Net change = (survivor growth + ingrowth + growth on removals + growth on mortality) - (mortality + timberland removals + land-clearing removals).

the ratio was shown as removal-to-growth. The ratios are reversed because if the ratio is always shown in a growth-to-removal format, then, when removals exceed growth, the ratio is compressed between 0.0 and 1.0. This can be misleading because a removal-to-growth ratio of 3.50 to 1.0 would be 0.29 to 1.0 when expressed in a growth-to-removal format. If removals are doubled, the ratio becomes 7.0 to 1.0 in a removal-to-growth format or 0.14 to 1.0 in a growth-to-removal format. The latter does not clearly illustrate the relative magnitude of the ratio.

There was only one survey unit with a positive net change to the softwood inventory. The South unit had a net change of plus 31.8 million cubic feet per year, an improvement over the plus 3.3 million cubic feet per year in the 1977 to 1987 survey period. Gross growth for the 1987 to 1994 survey period was 213.2 million cubic feet per year, while net growth was 196.0 million cubic feet per year. Removals increased over that of the previous survey period from 131.7 million cubic feet per year to 164.2 million cubic feet per year (table XVIII).

The NIPF ownership was the only ownership where softwood removals exceeded growth. The 1987 to 1994 survey period showed 461.5 million cubic feet per year of gross growth, 409.7 million cubic feet per year of net growth, and 507.3 million cubic feet per year of removals (table XIX). This resulted in a removal-to-growth ratio of 1.24 to 1.0. The result was a net change to the inventory of minus 97.6 million cubic feet per year, a decrease from the plus 30.2 million cubic feet per year for the 1977 to 1987 survey period. However, the removal-to-growth ratio may be better than appears because of the plot population change between surveys (as discussed earlier). In other words, removals may be overestimated.

Table XIX—Components of annual change in the volume of live trees by ownership class and species group, Mississippi, 1987 to 1994

		Growth component							
Ownership class	Species group	Survivor growth[a]	Ingrowth[b]	Growth on removals	Growth on mortality	Mortality	Timberland removals	Land-clearing removals	Net change[c]
		Million cubic feet							
National forest									
	Softwood	46.3	4.6	3.9	1.3	8.9	35.7	0.0	11.5
	Hardwood	22.8	3.6	1.2	0.7	6.9	8.6	0.0	12.8
	Total	69.1	8.2	5.1	1.9	15.8	44.3	0.0	24.3
Other public									
	Softwood	20.5	2.0	2.5	0.9	6.9	17.1	0.9	1.0
	Hardwood	27.7	2.5	0.8	2.2	15.7	6.5	1.7	9.3
	Total	48.2	4.6	3.3	3.1	22.7	23.6	2.6	10.3
Forest industry									
	Softwood	97.0	49.2	29.3	3.7	17.1	154.6	0.2	7.3
	Hardwood	45.6	11.3	11.3	3.1	19.1	88.6	0.4	-36.7
	Total	142.6	60.5	40.6	6.8	36.1	243.2	0.6	-29.5
Nonindustrial private									
	Softwood	289.6	70.6	88.6	12.7	51.8	489.1	18.2	-97.6
	Hardwood	354.4	57.0	48.1	15.3	103.0	362.1	27.5	-17.9
	Total	643.9	127.6	136.7	28.0	154.8	851.2	45.7	-115.5
All classes									
	Softwood	453.4	126.4	124.3	18.6	84.7	696.5	19.3	-77.8
	Hardwood	450.5	74.5	61.3	21.2	144.7	465.7	29.6	-32.6
	Total	903.9	200.8	185.6	39.8	229.4	1,162.2	48.9	-110.4

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes nongrowth trees.

[b] Includes ongrowth trees.

[c] Net change = (survivor growth + ingrowth + growth on removals + growth on mortality) - (mortality + timberland removals + land-clearing removals).

Interestingly, softwood plantations had a positive net change to the softwood plantation inventory—plus 54.9 million cubic feet per year (table XX). Additionally, both the NIPF and forest industry ownerships had positive net changes to the softwood plantation inventory—plus 26.3 and plus 33.3 million cubic feet per year, respectively. These were substantial improvements over the 1977 to 1987 survey period when the net change to all owners was minus 26.1 million cubic feet per year, NIPF was plus 8.9 million cubic feet per year, and forest industry was minus 34.2 million cubic feet per year.

Softwood Sawtimber Growth

Gross growth for softwood sawtimber was 3,078.1 million board feet per year, net growth was 2,801.6 million board feet per year, removals were 3,185.7 million board feet per year, and net change was minus 384.1 million board feet per year (table XXI). There were substantial changes since the 1977 to 1987 survey period. Gross growth increased by 364.0 million board feet per year (13 percent), net growth increased by 346.6 million board feet per year (14 percent), removals increased by 1,167.2 million board feet per year (58 percent), and the net change decreased by 820.5 million board feet per year.

Most of the growth occurred in the Central unit. There, net growth was 926.5 million board feet per year—33 percent of all net growth. Likewise, most of the removals came from the Central unit—34 percent or 1,069.9 million board feet per year.

Table XX—Components of annual change in the volume of live trees in plantations by ownership class and species group, Mississippi, 1987 to 1994

		Growth component							
Ownership class	Species group	Survivor growth[a]	Ingrowth[b]	Growth on removals	Growth on mortality	Mortality	Timberland removals	Land-clearing removals	Net change[c]
		Million cubic feet							
National forest									
	Softwood	8.4	2.7	1.5	0.4	1.7	14.7	0.0	-3.4
	Hardwood	1.8	0.6	0.5	0.0	0.4	3.5	0.0	-1.0
	Total	10.2	3.3	1.9	0.5	2.1	18.2	0.0	-4.4
Other public									
	Softwood	3.2	0.9	0.7	0.3	1.7	4.8	0.0	-1.3
	Hardwood	1.2	0.3	0.1	0.0	0.2	1.2	0.0	0.2
	Total	4.4	1.2	0.8	0.4	1.9	6.0	0.0	-1.1
Forest industry									
	Softwood	60.0	43.6	16.8	2.1	8.4	80.8	0.0	33.3
	Hardwood	7.2	4.3	3.9	0.3	2.0	29.2	0.0	-15.5
	Total	67.3	47.9	20.7	2.5	10.4	110.1	0.0	17.8
Nonindustrial private									
	Softwood	59.7	42.1	19	2	5.2	86.2	5.2	26.3
	Hardwood	11.1	3.7	5.7	0.4	2.8	39.5	1.2	-22.7
	Total	70.8	45.8	24.7	2.4	8.0	125.7	6.4	3.6
All classes									
	Softwood	131.4	89.3	37.9	4.9	17.0	186.5	5.2	54.9
	Hardwood	21.3	8.8	10.2	0.8	5.4	73.4	1.2	-39.0
	Total	152.7	98.2	48.1	5.7	22.4	259.9	6.4	16.0

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes nongrowth trees.

[b] Includes ongrowth trees.

[c] Net change = (survivor growth + ingrowth + growth on removals + growth on mortality) - (mortality + timberland removals + land-clearing removals).

Table XXI—Components of annual change in the volume of sawtimber by forest survey unit and species group, Mississippi, 1987 to 1994

Forest survey unit	Species group	Growth component								
		Survivor growth[a]	Ingrowth[b]	Growth on removals	Growth on mortality	Cull increment	Mortality	Timberland removals	Land-clearing removals	Net change[c]
		Million board feet[d]								
Delta										
	Softwood	10.6	8.0	6.7	1.2	2.8	2.5	47.1	0.0	-20.4
	Hardwood	231.2	101.1	35.3	12.0	33.5	81.2	246.2	7.0	78.6
	Total	241.8	109.1	41.9	13.2	36.3	83.7	293.4	7.0	58.2
Central										
	Softwood	551.0	209.9	207.6	13.2	17.5	72.7	1,052.0	17.9	-143.5
	Hardwood	210.3	119.1	69.6	6.8	2.6	38.5	413.4	17.2	-60.7
	Total	761.3	329.0	277.1	20.0	20.1	111.2	1,465.4	35.2	-204.1
North										
	Softwood	334.6	146.2	149.1	11.7	4.8	67.7	727.1	14.6	-162.9
	Hardwood	296.2	155.9	85.3	8.9	14.9	67.3	484.0	34.1	-24.4
	Total	630.8	302.1	234.4	20.6	19.7	135.0	1,211.1	48.8	-187.3
South										
	Softwood	419.5	235.4	132.8	9.4	12.6	52.1	614.8	33.6	109.1
	Hardwood	124.5	83.4	33.7	4.6	5.9	25.6	202.7	10.2	13.6
	Total	544.0	318.7	166.5	14.0	18.5	77.8	817.5	43.8	122.7
Southwest										
	Softwood	345.3	88.9	129.0	16.8	13.6	81.6	672.3	6.1	-166.4
	Hardwood	232.5	108.5	47.0	10.1	10.0	55.5	294.4	16.5	41.7
	Total	577.7	197.4	176.0	27.0	23.6	137.0	966.8	22.6	-124.7
All units										
	Softwood	1,661.1	688.3	625.1	52.3	51.3	276.5	3,113.4	72.3	-384.1
	Hardwood	1,094.6	568.0	270.9	42.5	66.8	268.1	1,640.7	85.1	48.9
	Total	2,755.7	1,256.3	896.0	94.8	118.2	544.7	4,754.1	157.4	-335.2

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes nongrowth trees.

[b] Includes ongrowth trees.

[c] Net change = (survivor growth + ingrowth + growth on removals + growth on mortality + cull increment) - (mortality + timberland removals + land-clearing removals).

[d] International 1/4-inch rule.

All of the survey units had a negative net change to the inventory with exception of the South unit. There, the net change was plus 109.1 million board feet per year. This was a substantial change from the previous inventory survey, when all the survey units had positive net changes to the softwood sawtimber inventory.

Most of the softwood sawtimber growth was on NIPF land (table XXII). Gross growth was 2,008.4 million board feet per year, and net change was minus 447.4 million board feet per year. The NIPF net change was higher than the State total (minus 384.1 million board feet per year), but positive net changes on public lands helped offset this decrease and reduce somewhat the overall total net change. The 1987 to 1994 estimates given earlier were substantial changes from the 1977 to 1987 period. Gross growth increased by 212.6 million board feet per year, net growth increased by 210.3 million board feet per year, removals increased by 1,119.5 million board feet per year, and net change decreased by 909.2 million board feet per year.

Table XXII—Components of annual change in the volume of sawtimber by ownership class and species group, Mississippi, 1987 to 1994

Ownership class	Species group	Growth component								
		Survivor growth[a]	Ingrowth[b]	Growth on removals	Growth on mortality	Cull increment	Mortality	Timberland removals	Land-clearing removals	Net change[c]
		Million board feet[d]								
National forest										
	Softwood	241.2	42.9	22.0	2.6	6.9	40.2	199.0	0.0	76.4
	Hardwood	64.1	25.6	5.0	1.2	-0.1	12.7	22.2	0.0	60.9
	Total	305.3	68.5	27.0	3.9	6.8	52.9	221.3	0.0	137.3
Other public										
	Softwood	111.0	16.5	12.0	2.7	5.3	29.9	79.8	4.7	33.0
	Hardwood	82.4	27.8	4.5	3.9	10.1	33.5	22.9	4.9	67.4
	Total	193.3	44.3	16.4	6.6	15.5	63.4	102.8	9.6	100.3
Forest industry										
	Softwood	273.3	180.1	132.1	10.6	10.6	50.3	601.2	1.2	-46.1
	Hardwood	104.8	61.2	46.7	6.7	15.5	37.6	297.3	0.8	-100.7
	Total	378.1	241.3	178.8	17.4	26.1	87.9	898.5	2.0	-146.8
Nonindustrial private										
	Softwood	1,035.7	448.9	459.0	36.3	28.5	156.1	2,233.3	66.4	-447.4
	Hardwood	843.3	453.4	214.7	30.7	41.3	184.4	1,298.3	79.4	21.4
	Total	1,879.0	902.2	673.7	67.0	69.8	340.5	3,531.6	145.8	-426.1
All classes										
	Softwood	1,661.1	688.3	625.1	52.3	51.3	276.5	3,113.4	72.3	-384.1
	Hardwood	1,094.6	568.0	270.9	42.5	66.8	268.1	1,640.7	85.1	48.9
	Total	2,755.7	1,256.3	896.0	94.8	118.2	544.7	4,754.1	157.4	-335.2

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes nongrowth trees.

[b] Includes ongrowth trees.

[c] Net change = (survivor growth + ingrowth + growth on removals + growth on mortality + cull increment) - (mortality + timberland removals + land-clearing removals).

[d] International 1/4-inch rule.

Many of Mississippi's NIPF stands were too young for growth to keep pace with the large increase in harvesting.

Gross growth on plantations was 695.6 million board feet per year, net growth was 650.9 million board feet per year, removals were 708.3 million board feet per year, and net change was minus 57.3 million board feet per year (table XXIII). There was little difference in the overall net change between the 1977 to 1987 and 1987 to 1994 survey periods. Net change improved slightly, going from minus 96.9 million board feet per year to minus 57.3 million board feet per year. However, there were big changes in growth and removals in the ownership categories. In 1987, the forest industry net change was minus 150.8 million board feet per year; this improved dramatically for the 1994 survey, rising to plus 20.4 million board feet per year. Most of this was due to net growth increasing and removals decreasing. The change in the NIPF ownership was the reverse of forest industry. There, net change went from plus 67.5 million board feet per year in the previous inventory to minus 26.7 million board feet per year in the 1994 survey. Most of this change was due to a substantial increase in removals, going from 173.8 million board feet per year in 1987 to 321.7 million board feet per year in 1994.

Table XXIII—Components of annual change in the volume of sawtimber in plantations by ownership class and species group, Mississippi, 1987 to 1994

Ownership class	Species group	Growth component								
		Survivor growth[a]	Ingrowth[b]	Growth on removals	Growth on mortality	Cull increment	Mortality	Timberland removals	Land-clearing removals	Net change[c]
		Million board feet[d]								
National forest										
	Softwood	18.8	15.7	7.8	0.4	0.0	6.0	82.0	0.0	-45.2
	Hardwood	3.6	2.3	1.7	0.1	-1.3	0.8	7.1	0.0	-1.4
	Total	22.4	18.1	9.5	0.5	-1.3	6.8	89.0	0.0	-46.7
Other public										
	Softwood	12.6	5.3	2.7	0.7	0.6	5.9	21.9	0.0	-5.7
	Hardwood	1.1	1.8	1.0	0.0	0.3	0.0	3.9	0.0	0.3
	Total	13.8	7.1	3.7	0.7	0.9	5.9	25.8	0.0	-5.4
Forest industry										
	Softwood	107.6	138.8	67.5	5.9	4.9	21.5	282.7	0.0	20.4
	Hardwood	7.2	6.8	13.9	0.5	1.7	1.2	71.8	0.0	-42.8
	Total	114.8	145.6	81.4	6.4	6.5	22.7	354.5	0.0	-22.5
Nonindustrial private										
	Softwood	121.2	104.5	75.3	2.7	2.6	11.3	303.6	18.1	-26.7
	Hardwood	19.1	10.3	21.1	0.3	0.5	3.4	115.2	1.2	-68.6
	Total	140.3	114.8	96.4	3.0	3.2	14.7	418.9	19.3	95.2
All classes										
	Softwood	260.2	264.4	153.3	9.6	8.1	44.7	690.2	18.1	-57.3
	Hardwood	31.1	21.2	37.6	0.9	1.3	5.3	198.0	1.2	-112.5
	Total	291.3	285.6	190.9	10.6	9.4	50.0	888.1	19.3	-169.8

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes nongrowth trees.

[b] Includes ongrowth trees.

[c] Net change = (survivor growth + ingrowth + growth on removals + growth on mortality + cull increment) - (mortality + timberland removals + land-clearing removals).

[d] International 1/4-inch rule.

Hardwoods

Gross growth for hardwoods was 607.5 million cubic feet per year, net growth was 462.8 million cubic feet per year, removals were 495.3 million cubic feet per year, and net change was minus 32.6 million cubic feet per year (table XVIII). Since the previous survey, gross growth and net growth decreased only slightly by 6.3 million cubic feet per year and 38.4 million cubic feet per year, respectively. However, removals increased dramatically, from 269.4 million cubic feet per year to 495.3 million cubic feet per year. This reversed a net change of plus 231.8 million cubic feet per year in 1987 to minus 32.6 million cubic feet per year in 1994.

Most of the hardwood net growth was in the North unit. This unit accounted for 30 percent of Mississippi's hardwood growth. Highest hardwood removals were in the Central and North units—128.4 million cubic feet per year and 152.4 million cubic feet per year, respectively. Together, these two units accounted for 57 percent of the State's hardwood removals.

Both forest industry and NIPF ownerships had a negative net change to the hardwood inventory—minus 36.7 million cubic feet and minus 17.9 million cubic feet per year, respectively. Public ownerships showed a positive net gain. NIPF ownership accounted for 80 percent of all hardwood net growth and 79 percent of all hardwood removals. This is slightly higher than the proportion of timberland owned by NIPF owners (72 percent).

Hardwood Sawtimber Growth

Gross growth for hardwood sawtimber was 2,042.8 million board feet per year, net growth was 1,774.7 million board feet per year, removals were 1,725.8 million board feet per year, and net change was plus 48.9 million board feet per year (table XXI). Both gross growth and net growth decreased since 1987. However, as in live growth, removals increased dramatically. They increased from 790.1 million board feet per year in 1987 to 1,725.8 million board feet per year in 1994.

The North unit had the highest net growth of hardwood sawtimber, 493.9 million board feet per year. This was 28 percent of all hardwood net growth. The remaining growth was almost evenly distributed among the other survey units. The North unit also accounted for most of the hardwood sawtimber removals, 30 percent. Interestingly, the Delta unit had net growth of 331.9 million board feet per year. This was 19 percent of all hardwood growth in Mississippi, but the Delta only contained 8 percent of the State's timberland. Likewise with removals, 15 percent of total removals came from the Delta unit (table XXI).

The NIPF ownership accounted for 79 percent of the net growth in hardwood sawtimber. In a similar proportion, 80 percent of removals came from NIPF lands. Removals on NIPF lands almost tripled since 1987, and this caused net change to drop from 943.2 million board feet per year to 21.4 million board feet per year (table XXII).

Plantations

Softwood plantations (see Plantations in appendix) have become a very important component of Mississippi's forest landscape. Although criticized for creating monocultural forest conditions and contributing to reductions in both botanical and faunal diversity, they do provide a means of concentrating timber production into select species. Additionally, focusing optimal timber management on pine plantations on the better sites could ultimately reduce harvesting pressures on the remaining timberland acres.

Identifying plantations in the field during the sampling phase of the survey can sometimes be difficult. Newly established and younger plantations are easily identified with their clearly defined rows. Not so easily determined are stands that, originally established as plantations, are no longer so identifiable. For example, the distinction may be blurred where only 20 percent of outplanted seedlings survived, or where older plantations have broken up and now display characteristics of naturally regenerated stands. This could come in the form of naturally regenerated hardwoods that were allowed to become established in a plantation stand.

The assessment of plantations in this bulletin was derived by screening data from the 1987 survey for artificially regenerated stands. If a plot was identified as artificially regenerated and there had been no commercial harvesting on the plot between surveys, the stand was still considered to be a plantation. New plantations were noted by the field crews for the 1994 survey. This methodology aids in tracking plantation failures and documents their current status. See Rosson (1995) for additional information about plantation methodology.

The timberland area for softwood plantations was 4.3 million acres in 1994 (table XXIV). This was a 1.1-million-acre increase over that reported for the 1987 survey. Most

Table XXIV—Area of timberland on plantations by ownership class and forest-type group, Mississippi, 1994

Ownership class	All groups	Forest-type group					
		Longleaf-slash	Loblolly-shortleaf	Oak-pine	Oak-hickory	Bottomland hardwoods[a]	Nontyped
		Thousand acres					
Public	319.8	74.2	127.5	61.0	37.6	12.9	6.7
Forest industry	1,658.2	202.7	1,001.9	298.9	142.1	6.1	6.5
Nonindustrial private	2,329.5	142.1	1,491.1	394.8	266.7	34.7	0.0
All classes	4,307.5	419.0	2,620.5	754.7	446.4	53.7	13.1

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes oak-gum-cypress and elm-ash-cottonwood types.

plantations were in the loblolly-shortleaf pine forest-type group, 2.6 million acres (61 percent of all plantations). Additionally, 419,000 acres were in the longleaf-slash pine forest-type group. In the case of the loblolly-shortleaf pine forest-type group, the plantation acreage represented 54 percent of the total area in the forest-type group. Similarly with the longleaf-slash pine plantations, 48 percent of all the forest-type group was in plantations. The longleaf-slash pine forest-type group plantation area increased only slightly since 1987, by 32,900 acres. However, the loblolly-shortleaf pine forest-type group plantation area almost doubled, from 1.4 million acres to 2.6 million acres.

Three forest-type groups appear in table XXIV that were, most likely, not plantations, but were probably pine plantation failures or where pine stocking was less than hardwood stocking. This includes the oak-pine, oak-hickory, and bottomland hardwood forest-type groups. The 1994 Mississippi survey did not identify hardwood plantations during sampling so it cannot be stated with absolute certainty that any of these hardwood forest-type groups were not plantations, but it is highly unlikely. Additionally, hardwood plantings usually are much harder to identify because most planting is done by hand. Therefore, site preparation work usually is minimal and neat, and straight rows that are readily identifiable are lacking.

Most of the plantation area was in NIPF ownership, 2.3 million acres. Forest industry followed with 1.7 million acres. NIPF acreage increased by 899,700 acres while forest industry acreage increased by 161,500 acres. Noteworthy is that, although forest industry owned 17 percent of timberland, 38 percent of all plantations were in that ownership.

Most of the plantations in Mississippi were young (table XXV). Only 441,900 acres were in plantations greater than 20 years of age. A large proportion of plantations were less than 20 years of age, 1.9 million acres (44 percent).

Mississippi had 1.4 million acres (32 percent) of plantations with less than 60 percent softwood stocking (table XXVI). For seedlings, this would be less than 360 trees per acre. There were 474,100 acres with less than 30 percent softwood stocking (less than 180 seedlings per acre). Most of the plantation acres were optimally stocked with more than 60 but less than 120 percent stocking in softwood. There were 2.5 million acres in this condition, 58 percent of plantation area.

Plantation softwood live-tree volume was 2,367.5 million cubic feet (table XXVII). This was 25 percent of the total softwood volume in the State. Fifty-eight percent of the plantation softwood volume was in trees 5.0 but less than 10.0 inches d.b.h. The volume was almost equally divided between forest industry and NIPF ownership.

Between 1987 and 1994, 1.3 million acres of plantations underwent some form of treatment or harvest (table XXVIII). A total of 611,100 acres had commercial harvest operation; 54 percent of these acres were on NIPF ownership lands and 39 percent were on forest industry lands. Additionally, 706,300 acres underwent some form of thinning or stand improvement operation; of these, 40 percent were performed on NIPF ownership lands and 48 percent on forest industry lands. Harvesting on plantations increased by 85,600 acres since 1987, while thinning and stand improvement operations decreased by 98,100 acres.

Table XXV—Area of timberland on plantations by ownership and age classes, Mississippi, 1994

		Age class (*years*)[a]						
Ownership class	All classes	5	15	25	35	45	46–92	Mixed age[b]
		Thousand acres						
Public	319.8	138.1	40.2	31.5	11.0	8.1	1.9	89.1
Forest industry	1,658.2	596.9	490.4	172.6	59.9	16.3	5.5	316.6
Nonindustrial private	2,329.5	1,145.1	417.7	65.7	53.3	10.9	5.5	631.3
All classes	4,307.5	1,880.2	948.3	269.8	124.1	35.2	12.8	1,037.0

Numbers in rows and columns may not sum to totals due to rounding.

[a] Values are midpoints of 10-year ranges, i.e., 5 = 0–10 years, 15 = 11–20 years, etc.

[b] Stand structure disturbed to the point where no single age class could be defined, i.e., two or more strata > 10 years difference in age.

Table XXVI—Softwood stocking on plantations by ownership and stocking classes, Mississippi, 1994

Ownership class	All classes	Stocking class (*percent*)				
		< 30	30–39	60–89	90–119	≥120
		Thousand acres				
Public	319.8	50.1	59.6	121.7	77.7	10.7
Forest industry	1,658.2	165.9	382.9	519.1	436.8	153.5
Nonindustrial private	2,329.5	258.2	471.7	719.5	605.9	274.2
All classes	4,307.5	474.1	914.2	1,360.4	1,120.4	438.4

Numbers in rows and columns may not sum to totals due to rounding.

Table XXVII—Softwood stocking on plantations by ownership and diameter classes, Mississippi, 1994

Ownership class	All classes	Diameter class (*inches at breast height*)			
		5.0–9.9	10.0–14.9	15.0–19.9	≥20
		Thousand acres			
Public	243.0	92.3	78.5	55.3	16.9
Forest industry	1,049.2	646.5	309.8	86.6	6.3
Nonindustrial private	1,075.2	638.6	329.7	86.2	20.8
All classes	2,367.5	1,377.3	718.0	228.1	44.0

Numbers in rows and columns may not sum to totals due to rounding.

Table XXVIII—Area of timberland on plantations by ownership class and treatment, Mississippi, 1994

Ownership class	Treatment		
	All treatments	Commercial harvest[a]	Thinning/stand improvement[b]
	Thousand acres		
Public	132.3	41.7	90.6
Forest industry	574.7	238.8	335.9
Nonindustrial private	610.3	330.6	279.7
All classes	1,317.3	611.1	706.3

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes all types of commercial harvests.

[b] Includes all types of stand treatment except natural disturbance.

Disturbance

Weather

During the last months of field work, north Mississippi was hit by a severe ice storm (February 8, 1994). A total of 32 counties had damaged trees (Jacobs 2000). However, the inventory loss from the storm was not reflected in the 1994 survey because affected counties had already been sampled. A total of 594 plots in the 1994 survey were measured between February and August 1994 (the conclusion of the survey), but they were all in the southern half of the State.

The aerial assessment by Jacobs (2000) covering portions of the 18 most severely affected counties showed a volume loss in softwoods of 111.3 million cubic feet. In hardwoods, the volume loss was 207.5 million cubic feet. This represented a volume loss of 15 percent for softwoods and 17 percent for hardwoods. For more details, see Jacobs (2000).

Harvesting

Between 1987 and 1994, 5.5 million acres of timberland underwent some form of commercial harvest activity (table XXIX). Most of the activity was partial harvesting, 3.5 million acres (64 percent). The amount of partial harvest

Table XXIX—Area of timberland by forest-type group prior to harvesting, ownership class, and harvesting activity, Mississippi, 1994

Forest-type group and ownership class	All classes	Commercial harvesting activity				
		None	Partial	Seed tree/ shelterwood	Clearcut	Salvage cut
		Thousand acres				
Longleaf-slash pine						
Public	227.0	170.6	26.4	0.0	30.0	0.0
Forest industry	262.7	138.2	47.9	0.0	76.7	0.0
Nonindustrial private	374.0	226.6	110.7	6.0	24.6	6.0
All classes	863.7	535.4	185.0	6.0	131.3	6.0
Loblolly-shortleaf pine						
Public	432.4	314.0	69.2	0.0	42.3	6.9
Forest industry	1,059.7	709.3	172.3	6.7	165.8	5.7
Nonindustrial private	2,369.5	1,162.6	714.6	41.6	450.7	0.0
All classes	3,861.5	2,185.9	956.1	48.2	658.7	12.5
Oak-pine						
Public	441.1	341.6	39.0	6.4	54.3	0.0
Forest industry	597.8	398.6	130.4	10.7	58.0	0.0
Nonindustrial private	2,365.4	1,460.6	624.2	11.3	257.9	11.4
All classes	3,404.3	2,200.8	793.5	28.4	370.2	11.4
Oak-hickory						
Public	358.2	311.2	30.8	0.0	16.2	0.0
Forest industry	717.9	556.1	81.5	6.4	73.9	0.0
Nonindustrial private	4,367.6	3,004.1	944.1	5.2	414.1	0.0
All classes	5,443.7	3,871.4	1,056.4	11.6	504.3	0.0
Bottomland hardwoods[a]						
Public	375.6	366.5	0.0	0.0	9.0	0.0
Forest industry	537.3	376.3	98.5	0.0	62.5	0.0
Nonindustrial private	2,310.9	1,762.4	403.5	0.0	145.0	0.0
All classes	3,223.8	2,505.2	502.0	0.0	216.6	0.0
All forest types						
Public	1,834.3	1,503.9	165.3	6.4	151.9	6.9
Forest industry	3,175.4	2,178.5	530.6	23.7	437.0	5.7
Nonindustrial private	11,787.3	7,616.3	2,797.1	64.1	1,292.3	17.5
All classes	16,797.0	11,298.7	3,493.0	94.2	1,881.1	30.0

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes oak-gum-cypress and elm-ash-cottonwood forest-type groups.

acreage decreased by 311,900 acres since the previous survey. Clearcut acreage was 1.9 million acres, also a decrease since the 1987 survey, by 168,400 acres. There is not a relationship between timberland area harvested and amount of volume removed. This is more clearly illustrated in the effective density graphs such as figure 13. Harvesting several acres of timberland with a stand volume of 2,000 board feet per acre yields much less volume than harvesting the same amount of acreage with a stand volume of more than 9,000 board feet per acre. This helps explain why removals increased since 1987, but the amount of timberland harvested actually decreased.

A large proportion of commercial harvesting was done on NIPF land (table XXIX). There, 2.8 million acres of partial harvesting and 1.3 million acres of clearcutting were carried out. This was 80 percent of all partial harvests and 69 percent of all clearcutting.

Most of the partial harvesting was done in the oak-hickory and loblolly-shortleaf pine forest-type group. Together, these two forest-type groups accounted for 58 percent of the partial harvests in Mississippi; the harvest acreage was almost evenly divided between the two groups with slightly more occurring in the oak-hickory group. In a similar manner, most of the clearcut acreage was in these same two forest-type groups, 658,700 acres in loblolly-shortleaf pine and 504,300 acres in oak-hickory. Together, these two forest-type groups accounted for 62 percent of all clearcutting in the State.

Tables XXX and XXXI show the harvest activity in Mississippi by the year of harvest. The year of harvest came from the assessment made by data collectors on individual trees (Rosson 1994). Based on available evidence on the plot, the assessment became less accurate as the time since harvest lengthens. It is not intended to portray harvest years accurately, but does give an idea of when most of the harvesting took place during the survey period.

The years 1990, 1991, and 1992 were years of high levels of harvesting activity in Mississippi (table XXX); 1992 had the highest level, 1.5 million acres. Forest industry harvesting was more evenly spread through the survey period. Clearcut harvest activity in upland stands was also distributed fairly evenly throughout the survey period with the exception of 1987, 1988, and 1994 (table XXXI). The years 1990, 1991, and 1992 were also the years of highest clearcut harvesting activity, 63 percent of all clearcuts. Interestingly, the clearcutting in the loblolly-shortleaf pine forest-type group was in 1990, 1991, and 1992, but the clearcuts in the oak-hickory forest-type group were distributed evenly through the survey period.

Table XXX—Area of timberland commercially harvested by year of harvest and ownership class, Mississippi, 1987 to 1994[a]

Year of harvest	All classes	Ownership class			
		National forest	Other public	Forest industry	Nonindustrial private
		Thousand acres			
1987	48.5	0.0	0.0	0.0	48.5
1988	225.8	0.0	17.3	66.9	141.6
1989	560.7	29.9	11.3	127.9	391.7
1990	1,038.5	33.6	34.0	192.3	778.7
1991	1,341.3	47.1	31.4	234.3	1,028.5
1992	1,457.4	32.2	34.8	230.6	1,159.8
1993	681.0	21.3	16.7	127.8	515.2
1994	145.1	15.6	5.2	17.3	107.0
All years	5,498.3	179.7	150.6	997.0	4,171.0

Numbers in rows and columns may not sum to totals due to rounding.

[a] Modified from Rosson. Current stand characteristics of Mississippi timberland harvested between 1977 and 1994. Manuscript in preparation. Timberland totaling 122,200 acres was not included in this table because of overlap in dates with the 1987 survey.

Table XXXI—Area of clearcut upland timberland by year of harvest and forest-type group, Mississippi, 1987 to 1994[a]

Year of harvest	All groups	Forest-type group[b]			
		Longleaf-slash pine	Loblolly-shortleaf pine	Oak-pine	Oak-hickory
			Thousand acres		
1987	16.7	0.0	5.6	0.0	11.1
1988	70.1	6.3	18.4	17.0	28.4
1989	230.8	16.8	97.1	47.2	69.7
1990	376.2	27.4	148.6	74.2	126.0
1991	347.5	27.6	149.3	83.9	86.7
1992	322.7	10.1	126.8	94.0	91.8
1993	254.7	43.1	78.3	48.8	84.6
1994	45.7	0.0	34.6	5.2	5.9
All years	1,664.6	131.3	658.8	370.2	504.3

Numbers in rows and columns may not sum to totals due to rounding.

[a] Modified from Rosson. Current stand characteristics of Mississippi timberland harvested between 1977 and 1994. Manuscript in preparation.

[b] Forest-type group prior to harvest.

Management

An assessment of management activity on timberland in Mississippi was also made during the survey period. Only timberland that was forested both in 1987 and 1994 was used in the assessment. Only a small proportion of timberland showed evidence of any type of management activity since 1987 (table XXXII). A total of 2.3 million acres had activity (only 14 percent of timberland). Most of this activity was in stand improvement operations (1.3 million acres), followed by site preparation activity (656,300 acres), and then thinning operations (339,800 acres).

The NIPF ownership had most of the management activity in stand improvements and site preparation. However, forest industry ownership was the leader in thinning operation activity. Interestingly, public-owned lands were second in stand improvement operations. Proportionally, activity by ownership was ranked differently. Looking at the data in this manner showed that forest industry conducted most of the management activity with the exception of stand improvements. Five percent of forest industry lands showed evidence of thinning versus 1 percent for NIPF lands and 3 percent for public lands. Public lands led in proportion of stand improvements with 23 percent versus 10 percent for forest industry and 5 percent for NIPF lands. Last, forest industry ranked first in proportions of their timberland that underwent site preparation activity with 9 percent versus 4 percent for public lands and 3 percent for NIPF lands.

Most of the thinning activity was in the loblolly-shortleaf pine forest-type group, 235,800 acres (69 percent). Probably this was most common in pine plantations. Additionally, most of the stand improvement activity was in the loblolly-shortleaf pine forest-type group, 461,000 acres (36 percent). Also noteworthy was 326,200 acres of stand improvement activity in longleaf-slash pine, and site preparation in the loblolly-shortleaf pine and oak-hickory groups, 229,700 and 200,700 acres, respectively. The oak-hickory forest-type group site preparation work was probably an indication of the conversion of these stands to softwood plantations.

One other assessment of Mississippi's timberland dealt with the proportion of site preparation activity to clearcut timberland. Clearcut timberland is usually most readily suitable for site preparation. The proportion of upland clearcuts and site preparation activity was 1.7 million acres (table XXIX) to 608,000 acres (table XXXII) or 2.74 to 1.0 for the survey period (48,300 acres of bottomland hardwood site preparation activity was not included here).

Treatment Opportunities

Possible treatment opportunities and options for Mississippi timberland, based on the 1994 survey, are given in table XXXIII. The estimates were derived from

Table XXXII—Area of timberland by forest-type group prior to activity, ownership class, and management activity, Mississippi, 1994

Forest-type group and ownership class	All classes	Management activity: None	Thinning operation	Stand improvement	Site preparation
		Thousand acres			
Longleaf-slash pine					
Public	227.0	108.2	4.9	106.7	7.2
Forest industry	262.7	112.7	23.4	85.6	41.0
Nonindustrial private	374.0	214.7	6.5	133.9	18.9
All classes	863.7	435.6	34.8	326.2	67.1
Loblolly-shortleaf pine					
Public	432.4	208.7	22.6	167.9	33.2
Forest industry	1,059.7	734.6	122.5	127.8	74.8
Nonindustrial private	2,369.5	1,991.7	90.7	165.3	121.7
All classes	3,861.5	2,935.0	235.8	461.0	229.7
Oak-pine					
Public	441.1	286.7	17.0	117.2	20.1
Forest industry	597.8	500.7	18.0	43.9	35.1
Nonindustrial private	2,365.4	2,206.9	11.6	91.7	55.2
All classes	3,404.3	2,994.3	46.7	252.9	110.5
Oak-hickory					
Public	358.2	329.0	5.4	23.8	0.0
Forest industry	717.9	559.3	0.0	54.8	103.9
Nonindustrial private	4,367.6	4,119.6	10.6	140.5	96.9
All classes	5,443.7	5,007.9	16.0	219.0	200.7
Bottomland hardwoods[a]					
Public	375.6	364.5	0.0	5.6	5.4
Forest industry	537.3	513.5	6.5	0.0	17.4
Nonindustrial private	2,310.9	2,264.4	0.0	21.0	25.5
All classes	3,223.8	3,142.4	6.5	26.6	48.3
All forest types					
Public	1,834.3	1,297.1	50.0	421.3	65.9
Forest industry	3,175.4	2,420.8	170.4	312.1	272.2
Nonindustrial private	11,787.3	10,797.3	119.5	552.3	318.2
All classes	16,797.0	14,515.2	339.8	1,285.8	656.3

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes oak-gum-cypress and elm-ash-cottonwood forest-type groups.

assessments of plot data and were not determined in the field during data collection. Plot parameters important in making these estimates were the stocking level of growing-stock trees, the amount of cull, species groups, stand-size class, amount of volume, and amount of damage. The threshold levels for these parameters and the various treatment classes were subjective, although they did help assess stand conditions and possible treatment options for improving timber productivity and quality.

At the time of the 1994 survey, 10.8 million acres of timberland were of adequate stocking of trees of sufficient quality (no treatment) to negate the need for implementation of any stand treatment (table XXXIII). This left 7.7

Table XXXIII—Area of timberland by forest-type group, ownership class, and treatment opportunity, Mississippi, 1994

Forest-type group and ownership class	All classes	Type of treatment: No treatment	Stand establishment: Regenerate	Stand establishment: Stand conversion	Intermediate treatment: Thin seedlings and saplings	Intermediate treatment: Thin poletimber	Intermediate treatment: Other stocking control	Final harvest: Regeneration cut	Final harvest: Salvage cut
				Thousand acres					
Longleaf-slash pine									
Public	237.7	180.1	24.3	0.0	0.0	7.2	6.7	19.4	0.0
Forest industry	226.2	184.1	12.7	0.0	0.0	6.5	5.5	17.6	0.0
Nonindustrial private	401.9	349.9	23.3	0.0	0.0	5.9	17.3	5.5	0.0
All classes	865.8	714.1	60.3	0.0	0.0	19.6	29.5	42.4	0.0
Loblolly-shortleaf pine									
Public	469.1	333.8	21.9	0.0	0.0	0.0	39.6	73.8	0.0
Forest industry	1,312.6	924.8	58.2	0.0	7.4	161.2	85.9	75.3	0.0
Nonindustrial private	3,103.5	2,156.1	217.4	0.0	10.3	246.1	191.0	282.6	0.0
All classes	4,885.2	3,414.7	297.5	0.0	17.6	407.3	316.4	431.6	0.0
Oak-pine									
Public	432.4	280.7	55.1	0.0	0.0	0.0	31.3	61.6	3.7
Forest industry	509.8	277.9	84.4	0.0	0.0	11.4	130.3	0.0	5.8
Nonindustrial private	2,275.5	1,320.5	390.0	0.0	0.0	12.8	445.6	106.6	0.0
All classes	3,217.7	1,879.1	529.5	0.0	0.0	24.3	607.2	168.1	9.4
Oak-hickory									
Public	342.7	232.8	23.7	3.7	0.0	8.4	46.7	12.0	15.4
Forest industry	580.5	261.9	147.6	0.0	0.0	5.6	154.2	11.3	0.0
Nonindustrial private	4,911.2	2,350.2	1,472.0	7.4	11.2	24.8	924.2	79.0	42.4
All classes	5,834.4	2,844.8	1,643.3	11.0	11.2	38.7	1,125.0	102.4	57.8
Bottomland hardwoods[a]									
Public	438.9	268.9	107.4	0.0	0.0	0.0	23.6	24.9	14.1
Forest industry	596.4	307.5	146.2	0.0	0.0	6.3	74.0	23.9	38.7
Nonindustrial private	2,676.0	1,410.3	644.4	5.0	6.4	34.2	251.0	207.9	117.0
All classes	3,711.4	1,986.6	897.9	5.0	6.4	40.4	348.5	256.7	169.8
Nontyped									
Public	30.1	0.0	30.1	0.0	0.0	0.0	0.0	0.0	0.0
Forest industry	12.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0
Nonindustrial private	30.7	0.0	30.7	0.0	0.0	0.0	0.0	0.0	0.0
All classes	72.8	0.0	72.8	0.0	0.0	0.0	0.0	0.0	0.0
All forest types									
Public	1,950.9	1,296.3	262.6	3.7	0.0	15.6	147.9	191.7	33.2
Forest industry	3,237.6	1,956.1	461.0	0.0	7.4	190.9	449.7	128.1	44.5
Nonindustrial private	13,398.8	7,587.0	2,777.8	12.3	27.9	323.8	1,829.0	681.5	159.4
All classes	18,587.3	10,839.4	3,501.4	16.0	35.3	530.3	2,426.6	1,001.3	237.0

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes oak-gum-cypress and elm-ash-cottonwood forest-type groups.

million acres of timberland with the potential for some form of stand treatment.

The largest class of potential treatment opportunities was the regeneration class. To be included in this class, a stand must be less than 50 percent stocked with growing-stock trees or be stocked with more than 50 but less than 60 percent in growing-stock trees, and in which the stocking of rough-and-rotten trees is more than 30 percent. There were 3.5 million acres in this class; mostly on NIPF lands (79

percent). Additionally, a large proportion was in the oak-hickory forest-type group (47 percent). It was likely that much of this land was in a cut-over condition and either had not had time for the establishment of adequate natural regeneration, or planting had not yet begun. In the case of the latter, NIPF owners may not have had plans for site preparation and planting due to economic conditions or other constraints.

There were three levels of intermediate stand treatments that were considered—sapling-seedling or precommercial thinnings, poletimber thinnings, and other stocking controls. Sapling-seedling stands more than 150 percent stocked with growing-stock trees were judged to need thinning. Mississippi had only 35,300 acres in this condition. The next intermediate treatment class was poletimber thinning. These were poletimber stands with more than 110 percent stocking in growing-stock trees. There were 530,300 acres in the State in this condition. The last intermediate treatment class was other-stocking control. This included all sapling-seedling or poletimber stands with more than 110 percent stocking, where more than 30 percent of this stocking was in rough-and-rotten trees. Mississippi had 2.4 million acres in this treatment opportunity class.

The last group of treatment opportunity classes was final harvest treatment; this included regeneration cuts and salvage cuts. Regeneration cuts were considered the final harvest of a rotation or harvest cycle, removing enough of the stand so that there is nothing, or not enough, left to manage for one more harvest. Regeneration, either natural or artificial, is necessary to establish the next manageable stand. Timberland that was considered a candidate for regeneration cutting had to be of sawtimber size, have more than 110 percent stocking in growing-stock trees, and have more than 5,000 board feet per acre. Mississippi had 1.0 million acres in this condition. Most of this area was on NIPF land, 681,500 acres (68 percent). Interestingly, more acreage qualified for a regeneration cut on public lands than on forest industry lands. The loblolly-shortleaf pine forest-type group had the most qualifying timberland, 431,600 acres (43 percent). Ranked second was bottomland hardwood forest-type groups with 256,700 acres qualifying (26 percent). Together, these two forest-type groups made up 69 percent of timberland area qualifying for a regeneration cut. The other class of timberland in the final harvest category was salvage cuts. To qualify, a stand had to be of poletimber or sawtimber size where more than 80 percent of stocking was made up of trees with a cull deduction due to damage from insect, disease, natural injury, or senescence. There were 237,000 acres of timberland qualifying, mostly on NIPF lands, 159,400 acres (67 percent). Additionally, most of this acreage was in the hardwood forest-type groups (oak-hickory and bottomland hardwood). Together, these two forest-type groups accounted for 227,600 acres of salvage cut eligibility (96 percent of all salvage-cut eligible lands).

Conclusion

The most substantial finding of the 1994 forest survey of Mississippi was the increase in the area of timberland. Although 374,500 acres of timberland diverted to a nonforest land use, 2.0 million acres reverted to a forest land use. This resulted in a net gain of 1.6 million acres over that of the 1987 survey. Most of this new area did not contribute to the growth and volume computations because of the young age of the trees in these stands. However, the contribution from these stands to the State's standing volume and annual growth will be substantial by the time of the next forest survey.

Plantation acreage increased substantially after the 1987 survey. In 1994, it was 4.3 million acres, a 1.1-million-acre increase. Plantations constituted some of the 2.0 million acres reverting to timberland, 753,100 acres (38 percent of reverting land). It would be interesting to know how much of this was implemented through the Conservation Reserve Program but, unfortunately, the FIA survey did not gather this information at the time of data collection.

Plantations made up 23 percent of timberland area in Mississippi and contributed 25 percent of the softwood live-tree volume. The expectation is that plantations should produce more softwood volume than natural stands. On average, softwood plantations across the Midsouth States are producing only about 30 percent more softwood volume than natural stands, not 100 percent more as is often reported (Rosson 1995). Although many of the plantations in Mississippi were young and not contributing to growth and volume, an effort that might increase their productivity in the future would be to improve plantation stocking. The 1994 survey showed 474,100 acres of plantations less than 30 percent stocked with softwoods and an additional 914,200 acres with stocking of more than 30 but less than 60 percent. Boosting stocking levels in these stands would increase future yields.

Shortleaf pine continued to decrease in its relative proportion of softwood volume. It probably will continue to be excluded in most pine planting regimens but will continue to play a secondary role to loblolly pine in natural regeneration. Of more concern is longleaf pine. Volume continued to decline and was only 6 percent of the softwood volume in Mississippi. The long-term contribution of this most valuable species to the State's softwood volume is uncertain.

The short-term forecast for Mississippi's softwood volume is favorable. Even with removals slightly exceeding growth in the 1994 survey, the addition of 1.6 million new timberland acres (contributing to growth and volume) will shift the balance to the point where growth exceeds removals by the time of the next survey. The only situation which would deter that is another large increase of removals over that reported for 1994. That seems unlikely.

The forecast for hardwoods is more uncertain. Overall, management favors pine over hardwood and, where allowed to grow, hardwoods are usually left to fend for themselves—all the way from regeneration to final harvest. This is not meant to infer that there are not any well-managed hardwood stands in Mississippi but that, on the whole, hardwoods regenerate and grow through their life cycle in a natural state. Ongoing emphasis on pine management will continue to exclude hardwoods.

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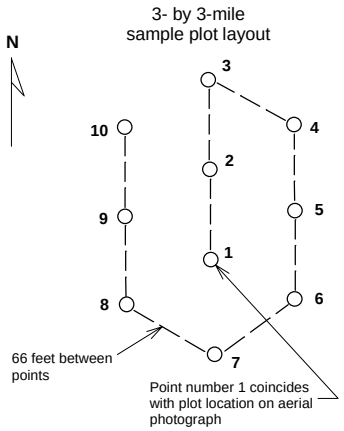
Appendix

Inventory Methods

Forest resource statistics were obtained by a two-phase sampling method employing a forest or nonforest classification system using aerial photographs (to determine forest area) and on-the-ground measurements of trees at permanent sample locations (to determine tree and stand parameters). Inventory volume and area statistics are required to give precise estimates at the State level to one standard error of the total, equal to 1 percent per million acres of forest land and to 5 percent per billion cubic feet.

The estimate of timberland area was based on interpreting dot grid counts, overlaid on recent aerial photographs with each dot classified as forest or nonforest. Each dot represented approximately 230 acres. The forest or nonforest estimate was then adjusted by ground-truth checks at all permanent sample locations. Permanent sample locations consisted of two types of plots: intensification plots (used only as ground truths for forest and nonforest classifications), and 3- by 3-mile plots (plots on a 3- by 3-mile square grid) where tree measurements and plot characteristics were recorded. The proportion of dots classified as forest was applied to U.S. Census land area data to develop an estimate of forest area in individual counties. Appropriate expansion factors (the timberland area each plot represents) for each forested 3- by 3-mile plot were assigned. The expansion factor was dependent on the number of forested plots in a county but averaged 5,760 acres per plot for the State.

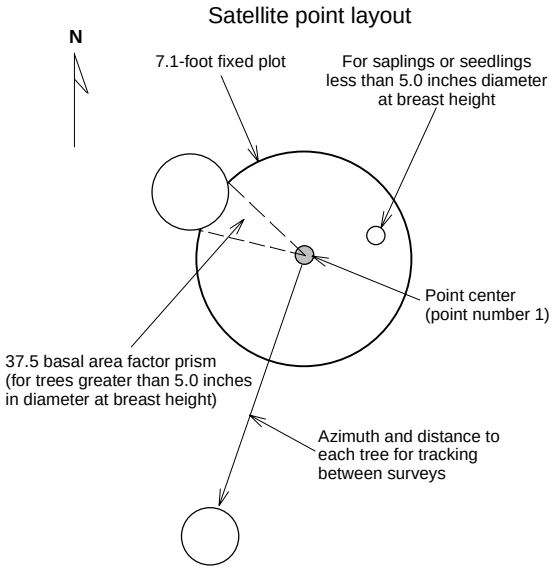
Each forested 3- by 3-mile sample plot consisted of 10 satellite points spread over an area of approximately 1 acre (appendix fig. 1). This design improved portrayal of stand



Appendix figure 1—Configuration of the 10 satelite points at a sample location, Mississippi, 1994.

conditions by eliminating the effect that vegetation clumping and open gaps would cause if only one point or a fixed plot were used at each location.

At each forested sample plot, trees 5.0 inches d.b.h. and larger were selected with a 37.5-basal-area-factor prism at each of the 10 satellite points; each tree selected with the prism represented 3.75 square feet of basal area per acre. Trees less than 5.0 inches d.b.h. but greater than or equal to 1.0 inch d.b.h. were tallied on a 1/275-acre circular fixed plot centered at the first three satellite points (appendix fig. 2).



Appendix figure 2—Configuration of a satellite point, Mississippi, 1994.

Volumes in Mississippi were derived from deterministic measurements of trees on forested sample locations. These deterministic measurements included d.b.h., bark thickness, total height, bole length, log length, and four upper stem diameters. Smalian's formula was used to compute volume. In addition, volume equations were developed to estimate the volume for trees not surviving the measurement period or for past volumes of new sample trees.

Data collection at each forested location also included estimates of site productivity, stand origin, slope, aspect, disturbance, management, and nontimber resources. Ownership information was obtained for each plot from county tax assessors' records and contact with landowners. Personnel from public agencies and other knowledgeable

people were consulted when classifying absentee farmers, individuals, corporations, or lessors.

Components of inventory volume change (growth, removals, and mortality) were estimated from tally tree data on remeasured sample plots. The remeasurement of sample plots allowed tracking of the history and volume change of each tally tree over time. This information was then used in assigning tally tree volumes and changes in volume to one of nine components of change: survivor growth, nongrowth, ingrowth, ongrowth, growth on removals, growth on mortality, mortality, timberland removals, and land-clearing removals. These components were then combined to estimate gross growth, net growth, and net change using a Beers and Miller (1964) approach, as modified by Van Deusen and others (1986).

Estimates of timberland area, volume, growth, removals, and mortality were based on the application of essentially the same inventory techniques to each survey measurement. However, there were important differences between the methods used in the 1987 and 1994 inventories. In many cases, improvements in methodology for deriving current estimates can raise concerns about reported trends between survey periods. Because such differences might discourage comparisons between 1987 and 1994 results, the major differences in procedures are documented in the following paragraph.

Classification of trees into growing-stock, rough, or rotten classes was modified in two ways to ensure compatibility among the eastern FIA work units: (1) in the 1994 survey, any tree that contained or was capable of producing one 12-foot or two 8-foot logs anywhere in the saw-log portion of the tree was classified as growing stock. The 1987 survey classified growing-stock trees as those that had or were capable of producing a 12-foot log only in the butt 16-foot section; and (2) the 1987 survey required that over one-half of the saw-log volume had to be utilizable for the tree to be classified as growing stock. The 1994 standard was that one-third of the saw-log volume in the saw-log portion of the tree had to be utilizable.

The change in the growing-stock definition (concerning log position) did affect direct comparisons between 1987 and 1994 estimates. To compensate for this definition change, the 1987 inventory data were reprocessed to make them compatible with the 1994 growing-stock standard. The total number of trees affected was small, and most were hardwoods because of growth habit. It was not possible to consistently reclassify all trees selected in the 1987 survey to the new growing-stock definition. Some died or had been cut. Because those trees were gone, the survey staff had no way of determining how they would have been classified under the new standard. Therefore, trend information for growing-stock trees in such cases was uncertain.

Expanding the definition of growing stock to include trees with saw-log portions that are one-third sound had virtually no impact; only a very few trees were affected by the definition change. A small number of sawtimber sample trees had between 33 and 50 percent of their saw-log portions sound, but most were reprocessed to resolve log position differences. Thus, the subsequent effect on estimation of growing-stock trends was small.

Users interested in trend analysis of growing-stock volume, growth, removals, and mortality should be aware of the impact of the growing-stock definition change; incompatibility arises from trees that were cut or died, affecting growth, removals, and mortality estimates. The magnitude was probably small but not possible to define with certainty.

Growing-stock comparisons between the 1987 and 1994 data sets were probably valid for most broad applications. In a more rigorous analysis, or where postdefined strata are selected (resulting in smaller data sets) and analyzed, one should determine that the changes are real and not due to definition or procedural changes. In such instances, the comparisons between surveys should be done using all live trees. This procedure eliminates any uncertainties caused by the growing-stock definition changes. Finally, to further enhance trend analysis, a slight improvement in precision was made in the 1987 volume estimates by using all the deterministic tree measurements from the 1994 survey to develop new volume coefficients for use where needed. Because of the change in the growing-stock standard and the improved volume coefficients, estimates for the reprocessed 1987 data may differ slightly from those previously published. In addition, some area and volume estimates in this bulletin may not match those previously published. This is because some minor corrections have been made to the data since release of those publications.

Statistical Reliability

A relative standard of accuracy has been incorporated into the forest survey. This standard satisfies user demands,

minimizes human and instrumental sources of error, and keeps costs within prescribed limits. The two primary types of error were measurement error and sampling error.

There are three elements of measurement error: (1) biased error, caused by instruments not properly calibrated; (2) compensating error, caused by instruments of moderate precision; and (3) accidental error, caused by human error in measuring and compiling. All of these were held to a minimum by a system that incorporates training, check plots, and editing and checking for consistency. Each new field person was trained for 3 to 4 months under the guidance of an experienced field person. Field work was checked by supervisors. Editing checks in the office screened out logical and keypunching errors for all plots. It was not possible to determine measurement error statistically, but the FIA holds it to a minimum through training, experienced supervision, and emphasis on careful work.

Sampling error was associated with the natural and expected deviation of the sample from the true population mean. This deviation was susceptible to a mathematical evaluation of the probability of error. Sampling errors for State totals in appendix table 1 were based on one standard error. That is,

Appendix table 1—Sampling errors for estimates of total timberland area[a] (1994), volume[b], average net annual growth[b] (1987 to 1994), and average annual removals[b] (1987 to 1994), Mississippi

Item	Component total	Units	Percent sampling error
Timberland area	18,587.3	Thousand acres	0.3
Total live trees			
Volume	22,649.2	Million cubic feet	1.6
Average net annual growth	1,100.7	Million cubic feet	1.8
Average annual removals	1,211.1	Million cubic feet	3.5
Average annual mortality	229.4	Million cubic feet	3.5
Total sawtimber			
Volume	77,189.9	Million board feet[c]	2.3
Average net annual growth	4,576.3	Million board feet[c]	2.2
Average annual removals	4,911.5	Million board feet[c]	3.9
Average annual mortality	544.7	Million board feet[c]	5.3
Softwood live trees			
Volume	9,362.5	Million cubic feet	2.8
Average net annual growth	638.0	Million cubic feet	2.7
Average annual removals	715.8	Million cubic feet	4.4
Average annual mortality	84.7	Million cubic feet	6.5
Softwood sawtimber			
Volume	39,337.7	Million board feet[c]	3.6
Average net annual growth	2,801.6	Million board feet[c]	3.2
Average annual removals	3,185.7	Million board feet[c]	4.8
Average annual mortality	276.5	Million board feet[c]	8.1
Hardwood live trees			
Volume	13,286.7	Million cubic feet	2.1
Average net annual growth	462.8	Million cubic feet	2.6
Average annual removals	495.3	Million cubic feet	4.9
Average annual mortality	144.7	Million cubic feet	4.0
Hardwood sawtimber			
Volume	37,852.2	Million board feet[c]	2.8
Average net annual growth	1,774.7	Million board feet[c]	3.2
Average annual removals	1,725.8	Million board feet[c]	5.7
Average annual mortality	268.1	Million board feet[c]	6.9

[a] By binomial formula.

[b] By random sampling formula.

[c] International 1/4-inch rule.

the chances were two out of three that, if the results of a 100-percent census were known, the sample results would be within the limits indicated.

Estimates smaller than State totals will have proportionally larger sampling errors. The smaller the area examined, the larger the sampling error. In addition, as area or volume totals are stratified by forest type, species, diameter class, ownership, or other subunits, the sampling error increases and is greatest for the smallest divisions. The magnitude of this increase is depicted in appendix table 2, which shows the sampling error to which the estimates are liable, two chances out of three.

Appendix table 2—Sampling error approximations to which estimates are liable at one standard error, Mississippi, 1994[a]

		Live trees				Sawtimber			
Sampling error	Timberland area	Volume	Average net annual growth	Average annual removals	Average annual mortality	Volume	Average net annual growth	Average annual removals	Average annual mortality
Percent	*Thousand acres*	*Million cubic feet*				*Million board feet*[b]			
1.0	1,672.9								
2.0	418.2	14,495.5	802.7						
3.0	185.9	6,442.4	356.8			45,425.6	2,218.8		
4.0	104.6	3,623.9	200.7	796.2	158.3	25,551.9	1,248.1	4,048.4	
5.0	66.9	2,319.3	128.4	509.6	101.3	16,353.2	798.8	2,591.0	
10.0	16.7	579.8	32.1	127.4	25.3	4,088.3	199.7	647.8	138.4
15.0	7.4	257.7	14.3	56.6	11.3	1,817.0	88.8	287.9	61.6
20.0	4.2	145.0	8.0	31.9	6.3	1,022.1	49.9	161.9	34.6
25.0	2.7	92.8	5.1	20.4	4.1	654.1	32.0	103.6	22.2

[a] Components for given sampling error derived by ratio approximation.
[b] International 1/4-inch rule.

Definitions

Average annual mortality. Average annual sound-wood volume of growing-stock or live trees that died from natural causes during the intersurvey period.

Average annual removals. Average net annual volume of growing-stock or live trees removed from the inventory by harvesting, cultural operations (such as timber stand improvement), land clearing, or changes in land use during the intersurvey period.

Average net annual growth. Average net annual volume increase of growing-stock or live trees during the intersurvey period.

Basal area. The area in square feet of the cross section at breast height of a single tree or of all the trees in a stand, usually expressed in square feet per acre.

Classes of trees used in growth computations

Ingrowth trees. Submerchantable-and-in at time 1 (previous inventory) and merchantable-and-in at time 2 (current inventory).

Mortality trees. Merchantable-and-in at time 1 and dead prior to time 2.

Nongrowth trees. Merchantable-and-out at time 1 and merchantable-and-in at time 2; included with survivor growth for growth computation.

Ongrowth trees. Submerchantable-and-out at time 1 and merchantable-and-in at time 2; included with ingrowth component for growth computation.

Removal trees. Merchantable-and-in at time 1 and removed prior to time 2.

Survivor trees. Merchantable-and-in at time 1 and time 2.

Commercial species. Tree species currently or potentially suitable for industrial wood products.

Cull increment. The change in growing-stock volume due to growing-stock, rough, or rotten trees changing tree class between surveys.

Cull trees. Rough or rotten trees.

D.b.h. (diameter at breast height). Tree diameter in inches (outside bark) at breast height (4.5 feet above the ground).

Diameter class. A classification of trees based on tree diameter at breast height. Two-inch diameter classes are commonly used by Forest Inventory and Analysis, with the even inch as the approximate midpoint for a class. For example, the 6-inch class includes trees 5.0 to 6.9 inches d.b.h.

D.o.b. (diameter outside bark). Stem diameter including bark.

Forest industry land. Land owned by companies or individuals operating wood-using plants (either primary or secondary).

Forest land. Land at least 10 percent stocked (10 percent canopy stocking is equivalent to 16.7 percent sample plot stocking) by forest trees of any size, or formerly having such tree cover, and not currently developed for nonforest uses. Minimum area considered for classification is 1 acre. Forest land is divided into timberland, reserved timberland, and woodland.

Forest-type group. A grouping of several detailed forest types. The grouping is based upon forest types with similar physiographic and physiognomic characteristics.

Elm-ash-cottonwood. Forests in which elms, ashes, or cottonwoods, singly or in combination, comprise a plurality of the stocking. Common associates include willow, sycamore, American beech, and maples.

Loblolly-shortleaf pine. Forests in which pines (except longleaf and slash pines) and eastern redcedar, singly or in combination, comprise a plurality of the stocking. Common associates include oaks, hickories, and gums.

Longleaf-slash pine. Forests in which longleaf or slash pines, singly or in combination, comprise a plurality of the stocking. Common associates include oaks, hickories, and gums.

Oak-gum-cypress. Bottomland forests in which tupelo, blackgum, sweetgum, oaks, or baldcypress, singly or in combination, comprise a plurality of the stocking, except where pines comprise 25 percent or more but less than 50 percent, in which case the stand would be classified

oak-pine. Common associates include cottonwoods, willow, ashes, elms, hackberries, and maples.

Oak-hickory. Forests in which upland oaks or hickories, singly or in combination, comprise a plurality of the stocking, except where pines comprise 25 percent or greater but less than 50 percent, in which case the stand would be classified oak-pine. Common associates include yellow-poplar, elms, maples, and black walnut.

Oak-pine. Forests in which hardwoods (usually upland oaks) comprise a plurality of the stocking, but in which softwoods, except baldcypress, comprise 25 percent or greater but less than 50 percent of the stocking. Common associates include gums, hickories, and yellow-poplar.

Gross growth. Total annual increase in stand volume computed on growing-stock trees or live trees 5.0 inches or greater in d.b.h. Gross growth equals survivor growth, plus ingrowth, plus nongrowth, plus ongrowth, plus growth on removals, plus growth on mortality, plus cull increment (cull increment only used for growing-stock computations).

Growing-stock trees. Living trees of commercial species classified as sawtimber, poletimber, saplings, and seedlings. Trees must contain at least one 12-foot or two 8-foot logs in the saw-log portion, currently or potentially (if too small to qualify), to be classed as growing stock. The log(s) must meet dimension and merchantability standards to qualify. Trees must also have, currently or potentially, one-third of the gross board-foot volume in sound wood.

Hardwoods. Dicotyledonous trees, usually broad-leaved and deciduous.

Live trees. All living trees. Included are all size classes, all tree classes, and both commercial and noncommercial species.

Log grades. A classification of logs based on external characteristics as indicators of quality or value.

Mortality. Number or sound wood volume of growing-stock or live trees that died from natural causes during a specified period.

National forest land. Federal land that has been legally designated as national forest or purchase units and other land under the administration of the U.S. Department of Agriculture Forest Service, including experimental areas.

Natural stands. Stands with no evidence of artificial regeneration, including those stands established by seed-tree regeneration methods.

Net change. Increase or decrease in stand volume computed on growing-stock trees or live trees 5.0 or more inches d.b.h. Net change is equal to net growth minus removals.

Net growth. Increase in stand volume computed on growing-stock trees or live trees 5.0 inches or more d.b.h. Net growth is equal to gross growth minus mortality.

NIPF. Abbreviation for nonindustrial private forest land, including corporate and individual ownerships.

Noncommercial species. Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Nonindustrial private forest land (corporate). Land privately owned by corporations other than forest industries and incorporated farms.

Nonindustrial private forest land (individual). Land privately owned by individuals other than forest industries or farmers.

Nonstocked stands. Stands less than 10 percent (canopy) or 16.7 percent (sample plot) stocked with live trees (see Stocking definition).

Nontyped. Timberland currently with no trees or occupied by live trees or seedlings where plot stocking is less than 16.7 percent.

Other Federal land. Federal land other than national forests.

Other public land. All Federal land, other than national forest land, and all State, county, and municipal lands.

Plantations. Forest stands that currently show evidence of being planted or artificially seeded. In this bulletin, stands that were classified as plantations in the previous survey and which had no commercial harvesting activity between survey periods were left classified as plantations. This definition is slightly different from that used in the usual representation of Forest Inventory and Analysis data. In that situation, the field person decides if a plantation is still present (based upon visible evidence).

Poletimber-sized trees. Softwoods 5.0 inches or larger but less than 9.0 inches d.b.h. and hardwoods 5.0 inches or larger but less than 11.0 inches d.b.h.

Poletimber stands. Stands at least 10 percent (canopy) stocked with live trees, with half or more of this stocking in sawtimber or poletimber trees, with poletimber stocking exceeding that of sawtimber stocking (see Stocking definition).

Productive-reserved forest land. See Reserved timberland.

Removals. The net volume of growing-stock or live trees removed from the inventory by harvesting, cultural operations (such as timber stand improvement), land clearing or changes in land use.

Reserved timberland. Public timberland withdrawn from timber utilization through statute or administrative designation.

Rotten trees. Live trees of commercial species that do not contain at least one 12-foot saw log, or two noncontiguous saw logs, each 8 feet or longer, now or prospectively, primarily because less than one-third of the gross board-foot tree volume is in sound material (see Growing-stock trees).

Rough trees. Live trees of commercial species that are unmerchantable for saw logs, currently or potentially, because of roughness or poor form in the saw-log section. Also included are all live trees of noncommercial species (see Growing-stock trees).

Salvable dead trees. Standing or downed dead trees that were formerly growing stock and are considered merchantable. Trees must be 5.0 inches d.b.h. or larger to qualify. If sawtimber size, a tree must have one 12-foot or two 8-foot logs meeting minimum log-grade standards and one-third of gross board-foot volume sound for softwoods and at least one-half sound for hardwoods. If poletimber size, a tree must have at least one-half of its volume sound.

Sapling-seedling stands. Stands at least 10 percent (canopy) stocked with live trees, with more than half of this stocking in saplings or seedlings (see Stocking definition).

Sapling-sized trees. Trees 1.0 inch or larger but less than 5.0 inches d.b.h.

Saw-log portion. That portion of the bole of a sawtimber tree between a 1-foot stump and the saw-log top.

Saw-log top. The point on the bole of a sawtimber tree above which a saw log cannot be produced. The minimum saw-log top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber-sized trees. Softwoods 9.0 inches or larger in d.b.h. and hardwoods 11.0 inches or larger in d.b.h.

Sawtimber stands. Stands at least 10 percent (canopy) stocked with live trees, with half or more of this stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Seedling-sized trees. Trees less than 1.0 inch d.b.h. and taller than 1 foot for hardwoods, taller than 6 inches for softwoods, and less than 0.5 inch in diameter at ground level for longleaf pine.

Select red oaks. A group of several red oak species that includes cherrybark, Shumard, and northern red oaks. Other red oak species are included in the “other red oaks” group.

Select white oaks. A group of several white oak species that includes white, swamp chestnut, swamp white, chinkapin, Durand, and bur oaks. Other white oak species are included in the “other white oaks” group.

Site class. A classification of forest land in terms of potential capacity to grow crops of industrial wood.

Softwoods. Coniferous trees, usually evergreen, having leaves that are needles or scalelike.

State, county, and municipal land. Land owned by States, counties, and local public agencies or municipalities, or land leased to these governmental units for 50 years or more.

Stocking. Stocking is a measure of the extent to which growth potential of the site is used by trees or preempted by vegetative cover. Stocking is determined by comparing the stand density in terms of number of trees or basal area with a specified standard. Therefore, full stocking is 100 percent of the stocking standard. Note that 10 percent canopy stocking is approximately equal to 16.7 percent sample-plot stocking.

The following tabulation shows the stocking density standard in terms of trees per acre by size class required for full stocking.

D.b.h. class	Trees per acre
Inches	
Seedlings	600
2	560
4	460
6	340
8	240
10	155
12	115
14	90
16	72
18	60
20	51
22	42
24	36
26	31
28	27
30	24

Stocking categories are arbitrarily defined as follows:

Optimally stocked. Stands 61 to 100 percent stocked with growing-stock trees. Such stands are growing toward a fully stocked condition (the ideal space required for each tree increases with age). Optimum growth and bole form occur in this range.

Overstocked. Stands greater than 100 percent stocked with growing-stock trees. These stands become stagnant and mortality of individuals increases as stocking levels rise above 100 percent.

Understocked. Stands 0 to 60 percent stocked with growing-stock trees. Such stands will take a very long time to reach full stocking. Meanwhile, poor bole form will result, and much of the productive growth will occur on heavy limbs instead of on the bole.

Timberland. Forest land that is producing, or is capable of producing 20 cubic feet of industrial wood per acre per year and is not withdrawn from timber utilization. Timberland is synonymous with “commercial forest land” in prior reports.

Tree grade. A classification of the saw-log portion of sawtimber trees based on: (1) the grade of the butt log or (2) the ability to produce at least one 12-foot or two 8-foot logs in the upper section of the saw-log portion.

Upper-stem portion. That part of the main stem of a sawtimber tree above the saw-log top to a d.o.b. of 4.0 inches or to the point where the main stem breaks into limbs.

Volume of cull. The cubic-foot volume of sound wood in rough-and-rotten trees at least 5.0 inches d.b.h. from a 1-foot stump to a minimum 4.0-inch top d.o.b. of the central stem or to the point where the central stem breaks into limbs.

Volume of growing stock. The cubic-foot volume of sound wood in growing-stock trees 5.0 inches or greater in d.b.h., from a 1-foot stump to a minimum 4.0-inch top d.o.b. of the central stem or to the point where the central stem breaks into limbs.

Volume of live trees. The cubic-foot volume of sound wood in growing-stock, rough, and rotten trees 5.0 inches or greater in d.b.h. from a 1-foot stump to a minimum 4.0-inch top d.o.b. of the central stem or to the point where the central stem breaks into limbs.

Volume of saw-log portion. The cubic-foot volume of sound wood in the saw-log portion of sawtimber trees. Volume is the net result after deductions for rot, sweep, and other defects that affect use for lumber.

Volume of sawtimber. The board-foot volume (International 1/4-inch rule) of sound wood in the saw-log portion of sawtimber trees. Volume is the net result after deductions for rot, sweep, and other defects that affect use for lumber.

Volume of timber. The cubic-foot volume of sound wood in growing-stock, rough, rotten, and salvable dead trees 5.0 inches or greater in d.b.h. from a 1-foot stump to a minimum 4.0-inch top d.o.b. of the central stem or to the point where the central stem breaks into limbs.

Woodland. Forest land incapable of producing 20 cubic feet of industrial wood per acre per year.

Conversion Factors

Metric equivalents of units used in this report
1 acre = 4,046.86 square meters or 0.404686 hectare
1 cubic foot = 0.028317 cubic meter
1 inch = 2.54 centimeters or 0.0254 meter
Breast height = 1.4 meters above the ground
1 square foot = 929.03 square centimeters or 0.0929 square
1 square foot per acre basal area = 0.229568 square meter per hectare
1 pound = 0.454 kilogram
1 ton = 0.907 metric ton

Species List[a]

Commercial Species

Scientific name[b]	Common name
Softwoods	
Chamaecyparis thyoides	Atlantic white-cedar
Juniperus silicicola	Southern redcedar
J. virginiana	Eastern redcedar
Pinus echinata	Shortleaf pine
P. elliottii	Slash pine
P. glabra	Spruce pine
P. palustris	Longleaf pine
P. taeda	Loblolly pine
P. virginiana	Virginia pine
Taxodium distichum	Baldcypress
Hardwoods	
Acer barbatum	Florida maple
A. negundo	Boxelder
A. rubrum	Red maple
A. saccharinum	Silver maple
A. saccharum	Sugar maple
Aesculus glabra	Ohio buckeye
Betula nigra	River birch
Carya spp.	Hickories
C. aquatica	Water hickory
C. cordiformis	Bitternut hickory
C. glabra	Pignut hickory
C. illinoensis	Pecan
C. laciniosa	Shellbark hickory
C. myristiciformis	Nutmeg hickory
C. ovata	Shagbark hickory
C. tomentosa	Mockernut hickory
Castanea pumila	Allegheny chinkapin
Catalpa spp.	Catalpa
Celtis laevigata	Sugarberry
C. occidentalis	Hackberry
Cornus florida	Flowering dogwood
Diospyros virginiana	Common persimmon
Fagus grandifolia	American beech
Fraxinus americana	White ash
F. pennsylvanica	Green ash
Gleditsia aquatica	Water locust
G. triacanthus	Honey locust
Ilex opaca	American holly
Juglans nigra	Black walnut
Liquidambar styraciflua	Sweetgum
Liriodendron tulipifera	Yellow-poplar
Maclura pomifera	Osage-orange
Magnolia acuminata	Cucumbertree
M. grandiflora	Southern magnolia
M. virginiana	Sweetbay
Morus rubra	Red mulberry
Nyssa aquatica	Water tupelo
N. sylvatica	Blackgum
N. sylvatica var. biflora	Swamp tupelo
Persea borbonia	Redbay
Platanus occidentalis	American sycamore
Populus spp.	Cottonwood
Prunus serotina	Black cherry
Quercus alba	White oak

Commercial Species

Scientific name[b]	Common name
Hardwoods (continued)	
Q. coccinea	Scarlet oak
Q. durandii	Durand oak
Q. falcata	Southern red oak
Q. falcata var. pagodifolia	Cherrybark oak
Q. laurifolia	Laurel oak
Q. lyrata	Overcup oak
Q. michauxii	Swamp chestnut oak
Q. muehlenbergii	Chinkapin oak
Q. nigra	Water oak
Q. nuttallii	Nuttall oak
Q. palustris	Pin oak
Q. phellos	Willow oak
Q. prinus	Chestnut oak
Q. rubra	Northern red oak
Q. shumardii	Shumard oak
Q. stellata	Post oak
Q. velutina	Black oak
Robinia pseudoacacia	Black locust
Salix spp.	Willow
Sassafras albidum	Sassafras
Tilia americana	American basswood
T. heterophylla	White basswood
Ulmus alata	Winged elm
U. americana	American elm
U. crassifolia	Cedar elm
U. rubra	Slippery elm

Noncommercial Species

Aesculus spp.	Buckeye
Ailanthus altissima	Ailanthus
Aleurites fordii	Tung-oil tree
Amelanchier spp.	Serviceberry
Bumelia spp.	Chittamwood
Carpinus caroliniana	American hornbeam
Castanea spp.	Chinkapin
Cercis canadensis	Eastern redbud
Crataegus spp.	Hawthorn
Magnolia macrophylla	Bigleaf magnolia
Malus spp.	Apple
Melia azedarach	Chinaberry
Morus alba	White mulberry
Ostrya virginiana	Eastern hophornbeam
Oxydendrum arboreum	Sourwood
Paulownia tomentosa	Royal Paulownia
Planera aquatica	Water-elm
Prunus spp.	Plums, cherries (other than black cherry)
Q. incana	Bluejack oak
Q. laevis	Turkey oak
Q. marilandica	Blackjack oak
Q. virginiana	Live oak
Sapium sebiferum	Chinese tallowtree
Vaccinium arboreum	Sparkleberry

[a] Scientific and common names of tree species ≥1.0 inch d.b.h. occurring in the FIA sample, Mississippi, 1994.

[b] Nomenclature (Little 1979).

Index of Detailed Tables

Table 1—Area by land class, Mississippi, 1994

Land class	Area
	Thousand acres
Forest land	
Timberland	18,587.3
Reserved timberland	7.1
Woodland	0.0
Total	18,594.5
Nonforest land	
Cropland[a]	6,747.6
Other	4,682.6
Total	11,430.2
All classes[b]	30,024.7

Numbers in column may not sum to total due to rounding.

[a] U.S. Department of Commerce, Bureau of the Census, 1989.

[b] U.S. Department of Commerce, Bureau of the Census, 1991.

Table 2—Area of timberland by ownership class, Mississippi, 1994

Ownership class	Area
	Thousand acres
Public	
National forest	1,106.6
Other Federal	434.6
State	310.2
County	99.5
Total	1,950.9
Private	
Forest industry	3,237.6
Miscellaneous private	
Individual	12,322.5
Corporate	1,076.3
Total	16,636.4
All classes	18,587.3

Numbers in column may not sum to totals due to rounding.

Table 3—Area of timberland by stand-size and ownership classes, Mississippi, 1994

		Ownership class			
Stand-size class	All classes	National forest	Other public	Forest industry	Nonindustrial private
			Thousand acres		
Sawtimber	7,746.1	757.3	561.0	1,073.1	5,354.7
Poletimber	3,772.9	134.7	88.2	824.2	2,725.8
Sapling-seedling	6,995.4	214.6	165.0	1,328.3	5,287.6
Nonstocked	72.8	0.0	30.1	12.0	30.7
All classes	18,587.3	1,106.6	844.3	3,237.6	13,398.8

Numbers in rows and columns may not sum to totals due to rounding.

Table 4—Area of timberland by stand-volume and ownership classes, Mississippi, 1994

Stand-volume class	All classes	Ownership class: National forest	Other public	Forest industry	Nonindustrial private
Board feet/acre [a]		*Thousand acres*			
Less than 1,500	7,995.0	177.8	236.1	1,662.0	5,919.0
1,500–5,000	4,789.1	201.1	173.5	718.6	3,696.0
5,000 or more	5,803.3	727.8	434.7	857.0	3,783.8
All classes	18,587.3	1,106.6	844.3	3,237.6	13,398.8

Numbers in rows and columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

Table 5—Area of timberland by percent growing-stock and cull trees, Mississippi, 1994

Growing-stock trees	Cull trees (*percent stocking*)							
	Total	0–10	10–20	20–30	30–40	40–50	50–60	60+
Percent stocking				*Thousand acres*				
0–10	206.9	67.4	18.1	19.4	32.5	17.4	7.4	44.9
10–20	233.6	57.8	7.4	55.5	16.6	12.3	25.6	58.4
20–30	407.7	55.7	48.4	34.1	46.8	43.0	48.1	131.6
30–40	660.3	57.2	52.8	79.7	107.3	83.7	59.4	220.1
40–50	901.7	49.3	64.4	118.9	213.6	146.8	126.0	182.6
50–60	1,637.5	117.0	245.1	279.7	352.0	286.3	205.2	152.2
60–70	2,205.2	201.3	342.8	600.9	406.7	385.1	154.7	113.7
70–80	2,604.3	263.5	512.4	729.8	573.4	340.4	134.9	49.9
80–90	2,615.7	377.8	794.0	659.3	507.0	196.8	80.7	0.0
90–100	2,489.4	579.7	775.1	717.8	271.6	124.2	15.2	5.7
100–110	1,957.1	625.2	766.0	362.8	137.2	60.1	5.7	0.0
110–120	1,262.9	505.5	552.6	165.6	33.4	5.7	0.0	0.0
120–130	791.7	452.4	259.8	69.2	10.3	0.0	0.0	0.0
130–140	366.6	267.9	80.8	17.9	0.0	0.0	0.0	0.0
140–150	169.6	141.6	28.1	0.0	0.0	0.0	0.0	0.0
150–160	54.8	54.8	0.0	0.0	0.0	0.0	0.0	0.0
>160	22.3	22.3	0.0	0.0	0.0	0.0	0.0	0.0
Total	18,587.3	3,896.3	4,547.7	3,910.8	2,708.3	1,701.8	863.2	959.2

Numbers in rows and columns may not sum to totals due to rounding.

Table 6—Average basal area of live trees on timberland by ownership, tree class, species, and tree-size class, Mississippi, 1994

Ownership and tree class	All species	Softwood			Hardwood		
		Sapling-seedling	Poletimber	Sawtimber	Sapling-seedling	Poletimber	Sawtimber
	Square feet per acre						
National forest							
Growing stock	75.8	3.0	7.1	31.9	3.4	12.2	18.2
Rough and rotten	18.9	0.9	0.5	0.1	8.3	4.9	4.2
Total	94.7	3.9	7.6	32.0	11.7	17.1	22.4
Other public							
Growing stock	66.7	1.6	3.4	17.0	3.9	11.9	28.9
Rough and rotten	18.6	0.3	0.4	0.1	6.9	4.7	6.2
Total	85.3	1.9	3.8	17.1	10.8	16.6	35.1
Forest industry							
Growing stock	59.1	7.1	13.7	14.0	4.7	8.2	11.4
Rough and rotten	13.6	1.0	0.5	0.1	6.4	3.0	2.6
Total	72.7	8.1	14.2	14.2	11.1	11.2	14.0
Nonindustrial private							
Growing stock	55.4	3.8	6.5	10.9	4.6	12.1	17.4
Rough and rotten	17.0	0.6	0.4	0.3	6.9	4.6	4.3
Total	72.4	4.4	6.9	11.2	11.6	16.6	21.7
All classes							
Growing stock	57.8	4.2	7.7	13.0	4.5	11.4	17.0
Rough and rotten	16.6	0.7	0.4	0.3	6.9	4.3	4.1
Total	74.4	4.9	8.1	13.2	11.4	15.7	21.0

Numbers in rows and columns may not sum to totals due to rounding.

Table 7—Area of timberland by site and ownership classes, Mississippi, 1994

Site class	All classes	Ownership class			
		National forest	Other public	Forest industry	Nonindustrial private
Ft^3/acre/year	*Thousand acres*				
≥165	2,279.7	173.3	141.0	392.8	1,572.6
120 to 164	5,628.0	429.3	254.8	931.2	4,012.7
85 to 119	7,352.8	357.5	270.5	1,337.5	5,387.3
50 to 84	3,035.7	142.8	119.9	546.7	2,226.3
< 49	291.2	3.7	58.1	29.5	200.0
All classes	18,587.3	1,106.6	844.3	3,237.6	13,398.8

Numbers in rows and columns may not sum to totals due to rounding.

Table 8—Area of timberland by forest-type group and ownership class, Mississippi, 1994

Forest type	All classes	Ownership class			
		National forest	Other public	Forest industry	Nonindustrial private
	Thousand acres				
Longleaf-slash pine	865.8	176.7	61.0	226.2	401.9
Loblolly-shortleaf pine	4,885.2	328.6	140.5	1,312.6	3,103.5
Oak-pine	3,217.7	303.8	128.7	509.8	2,275.5
Oak-hickory	5,834.4	183.7	159.0	580.5	4,911.2
Oak-gum-cypress	3,560.8	113.9	305.8	575.0	2,566.2
Elm-ash-cottonwood	150.6	0.0	19.3	21.4	109.9
Nontyped	72.8	0.0	30.1	12.0	30.7
All groups	18,587.3	1,106.6	844.3	3,237.6	13,398.8

Numbers in rows and columns may not sum to totals due to rounding.

Table 9—Area of noncommercial forest land by forest-type group, Mississippi, 1994

Forest-type group	All areas	Noncommercial forest land	
		Productive-reserved areas	Unproductive areas
	Thousand acres		
Longleaf-slash pine	0.0	0.0	0.0
Loblolly-shortleaf pine	0.0	0.0	0.0
Oak-pine	7.1	7.1	0.0
Oak-hickory	0.0	0.0	0.0
Oak-gum-cypress	0.0	0.0	0.0
Bottomland hardwood	0.0	0.0	0.0
All groups	7.1	7.1	0.0

Numbers in rows and columns may not sum to totals due to rounding.

Table 10—Number of growing-stock trees on timberland by species and diameter class, Mississippi, 1994

Species	All classes	Diameter class (*inches at breast height*) 5.0–6.9	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0 and larger
					Thousand trees						
Softwoods											
Longleaf pine	38,577	10,700	9,336	5,838	5,199	4,057	2,094	891	323	138	0
Slash pine	91,900	44,820	23,783	11,343	5,775	3,507	1,518	714	299	141	0
Shortleaf pine	102,805	27,504	26,735	20,191	14,178	7,390	4,496	1,403	571	332	4
Loblolly pine	580,336	282,599	140,491	59,419	37,315	24,357	16,733	9,107	5,172	4,979	163
Spruce pine	6,486	1,393	1,480	948	724	544	450	341	232	360	15
Redcedar	15,938	9,107	3,895	1,469	824	356	182	54	35	16	0
Hemlock-spruce	188	105	66	0	0	0	17	0	0	0	0
Cypress	10,606	3,111	1,749	1,214	1,441	1,177	741	439	305	322	105
Total softwoods	846,836	379,340	207,536	100,422	65,457	41,389	26,232	12,949	6,937	6,289	286
Hardwoods											
Select white oaks[a]	67,207	22,716	15,183	9,115	6,179	5,023	3,531	2,342	1,269	1,765	84
Select red oaks[b]	34,674	8,364	6,026	5,902	3,494	2,990	2,397	2,034	1,154	1,927	387
Other white oaks	51,196	16,230	13,300	7,839	5,149	3,518	2,265	1,160	736	874	125
Other red oaks	181,424	55,935	38,448	27,634	19,156	14,246	10,036	5,767	3,906	5,321	975
Sweet pecan	3,470	1,035	538	569	320	280	232	140	67	216	72
Water hickory	6,251	2,279	1,085	847	589	432	291	349	157	207	16
Other hickories	50,214	17,981	11,066	6,768	5,590	3,732	2,468	1,232	792	577	8
Persimmon	6,004	3,226	1,424	737	444	46	50	55	23	0	0
Hard maples	1,434	554	483	115	146	59	12	40	10	15	0
Soft maples	34,943	20,614	8,128	3,432	1,397	851	347	96	48	26	4
Boxelder	6,551	2,517	1,605	955	545	528	206	152	31	13	0
Beech	6,392	1,556	1,420	803	467	449	484	509	224	415	65
Sweetgum	214,307	95,903	53,585	30,469	14,699	8,272	5,814	2,521	1,409	1,492	143
Blackgum	51,841	20,405	13,226	7,444	4,712	3,110	1,796	674	203	250	24
Other gums/tupelos	23,121	6,423	5,760	4,757	2,393	1,612	980	698	278	212	8
White ash	5,311	1,984	1,155	649	476	401	323	76	128	114	6
Other ashes	23,003	7,960	5,070	3,245	2,320	1,446	1,162	840	389	476	95
Sycamore	7,953	1,527	2,038	840	991	799	581	427	195	516	41
Cottonwood	1,787	109	267	194	138	187	169	78	131	315	199
Basswoods	877	105	267	95	162	69	67	29	37	41	5
Yellow-poplar	32,329	10,206	6,073	4,180	3,735	2,796	1,916	1,453	849	1,014	107
Magnolias	2,865	949	614	438	258	166	127	122	81	102	8
Sweetbay	24,711	10,165	6,460	3,839	1,934	1,295	529	331	88	66	4
Willow	7,015	2,223	1,876	1,006	409	539	274	107	185	342	54
Black walnut	1,128	627	147	131	120	24	18	41	0	20	0
Black cherry	14,333	8,718	2,631	1,763	572	228	162	156	31	70	0
American elm	12,115	3,993	3,297	1,662	1,387	871	442	210	122	119	11
Other elms	22,816	11,754	5,231	2,576	1,402	942	460	202	104	145	0
River birch	2,281	844	189	427	221	183	249	90	42	36	0
Hackberry	22,039	5,116	4,540	4,396	2,759	2,197	1,306	768	447	492	15
Black locust	1,233	644	207	210	75	47	50	0	0	0	0
Other locusts	727	126	83	104	215	43	45	35	54	22	0
Sassafras	3,511	1,799	636	561	179	110	101	43	11	61	9
Dogwood	7,657	7,058	600	0	0	0	0	0	0	0	0
Holly	3,007	1,752	905	191	144	0	0	15	0	0	0
Other commercial	2,532	1,711	406	180	113	56	41	25	0	0	0
Total hardwoods	938,260	355,105	213,969	134,073	82,889	57,549	38,936	22,815	13,200	17,260	2,465
All species	1,785,096	734,446	421,504	234,495	148,345	98,937	65,168	35,765	20,136	23,548	2,751

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes white, swamp chestnut, chinkapin, and bur oaks.

[b] Includes cherrybark, northern red, and Shumard oaks.

Table 11—Volume of timber on timberland by class of timber and by softwoods and hardwoods, Mississippi, 1994

Class of timber	All species	Softwood	Hardwood
	Million cubic feet		
Sawtimber trees			
Saw-log portion	12,372.4	6,124.8	6,247.6
Upper-stem portion	2,495.7	982.1	1,513.6
Total	14,868.1	7,106.9	7,761.1
Poletimber trees	5,743.1	2,101.4	3,641.6
All growing stock	20,611.1	9,208.4	11,402.8
Rough trees	1,704.6	146.0	1,558.6
Rotten trees	333.5	8.2	325.3
Salvable dead trees	108.2	63.3	44.9
All classes	22,757.4	9,425.8	13,331.6

Numbers in rows and columns may not sum to totals due to rounding.

Table 12—Volume of growing stock and sawtimber on timberland by ownership class and by softwoods and hardwoods, Mississippi, 1994

	Growing stock			Sawtimber		
Ownership class	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Million cubic feet			*Million board feet* [a]		
National forest	2,133.5	1,373.7	759.7	10,097.9	7,465.7	2,632.2
Other public	1,311.6	507.5	804.1	5,871.6	2,703.4	3,168.2
Forest industry	3,270.0	1,891.5	1,378.5	11,326.9	6,726.1	4,600.8
Nonindustrial private	13,896.1	5,435.6	8,460.4	49,893.5	22,442.5	27,450.9
All classes	20,611.1	9,208.4	11,402.8	77,189.9	39,337.7	37,852.2

Numbers in rows and columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

Table 13—Volume of growing stock on timberland by species and diameter class, Mississippi, 1994

Species	All classes	Diameter class (*inches at breast height*) 5.0–6.9	7.0–8.9	9.0–10.9	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0 and larger
					Million cubic feet						
Softwoods											
Longleaf pine	596.2	34.6	67.4	81.3	113.0	130.4	89.6	48.9	20.2	10.9	0.0
Slash pine	771.1	114.5	148.7	141.2	117.9	108.1	66.0	40.1	21.2	13.4	0.0
Shortleaf pine	1,529.6	83.5	208.9	293.6	328.2	246.8	207.2	84.1	42.7	33.8	0.7
Loblolly pine	5,855.0	601.6	773.8	711.6	757.8	773.3	749.4	527.7	387.6	540.6	31.8
Spruce pine	159.4	2.8	9.9	12.2	14.8	17.7	19.7	20.8	18.0	40.4	3.2
Redcedar	81.0	20.8	18.8	13.7	11.6	7.2	4.9	1.9	1.5	0.6	0.0
Hemlock-spruce	1.3	0.3	0.4	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Cypress	214.8	6.1	9.2	13.6	28.3	37.2	29.1	25.2	19.7	28.9	17.6
Total softwoods	9,208.4	864.2	1,237.3	1,267.1	1,371.5	1,320.5	1,166.4	748.7	510.9	668.5	53.2
Hardwoods											
Select white oaks[a]	975.4	60.1	93.8	106.8	120.8	136.8	127.5	109.4	70.2	137.2	12.7
Select red oaks[b]	749.5	22.9	38.5	69.2	67.1	79.4	86.7	95.4	66.6	166.5	57.2
Other white oaks	558.8	38.3	71.4	75.4	78.7	76.1	64.1	43.5	33.2	61.4	16.7
Other red oaks	2,715.7	150.5	234.7	308.8	339.2	352.6	336.5	247.4	211.5	400.1	134.6
Sweet pecan	76.3	2.0	3.5	6.5	5.4	7.3	8.0	6.2	4.5	20.0	12.9
Water hickory	95.3	5.8	5.4	7.9	9.6	10.4	10.1	17.2	8.7	18.2	2.0
Other hickories	614.0	40.9	60.6	73.3	102.0	96.0	90.2	57.6	46.1	46.4	1.0
Persimmon	38.8	8.4	8.4	8.0	7.9	0.9	1.7	2.1	1.3	0.0	0.0
Hard maples	13.4	1.2	2.5	1.2	2.7	1.7	0.4	1.7	0.7	1.2	0.0
Soft maples	195.4	56.9	47.6	33.3	21.6	18.2	9.9	3.2	2.4	2.0	0.4
Boxelder	57.0	5.5	9.5	9.3	8.1	11.5	5.7	4.9	1.9	0.7	0.0
Beech	130.4	3.6	8.4	8.5	7.5	11.3	16.0	22.8	11.8	33.0	7.6
Sweetgum	2,009.3	224.1	322.5	349.1	285.4	228.3	225.7	127.6	89.4	133.2	24.0
Blackgum	468.0	50.6	74.9	77.3	78.5	75.3	57.1	27.0	9.6	15.8	1.8
Other gums/tupelos	264.5	17.8	34.4	50.7	41.2	38.5	31.4	25.8	13.2	11.0	0.7
White ash	73.7	5.9	8.1	7.2	9.3	9.6	12.0	3.4	8.2	9.1	0.8
Other ashes	296.4	23.3	35.3	34.6	39.6	35.0	35.1	31.8	19.2	32.4	10.2
Sycamore	178.2	5.2	14.4	10.4	21.0	21.7	22.0	21.7	11.7	44.2	5.9
Cottonwoods	107.6	0.2	1.4	1.8	2.2	4.2	5.3	3.8	8.5	32.6	47.6
Basswoods	18.2	0.5	1.5	1.3	2.8	2.0	2.3	1.5	1.9	3.3	0.9
Yellow-poplar	574.5	27.4	38.1	46.9	70.0	79.7	74.2	73.6	54.7	92.4	17.6
Magnolias	40.2	2.2	3.5	4.1	4.3	4.2	4.6	5.7	4.2	6.6	0.7
Sweetbay	204.6	29.0	40.4	41.5	31.0	29.0	14.8	11.6	3.7	3.3	0.3
Willow	113.8	5.8	9.9	9.1	6.6	12.0	8.5	5.7	15.8	32.7	7.7
Black walnut	10.3	1.9	0.8	1.4	2.2	0.6	0.6	1.8	0.0	1.0	0.0
Black cherry	91.0	21.8	15.3	17.9	10.8	6.6	6.2	7.0	1.7	3.8	0.0
American elm	130.1	10.2	19.8	18.5	22.7	20.9	12.4	8.3	6.3	8.8	2.1
Other elms	174.7	30.6	29.7	26.9	24.4	24.4	14.7	8.5	5.3	10.3	0.0
River birch	32.7	2.3	1.6	5.1	4.2	4.2	8.1	3.5	1.4	2.3	0.0
Hackberry	301.1	13.1	25.2	46.6	45.4	50.3	38.8	28.6	23.0	28.5	1.6
Black locust	8.7	1.7	1.0	2.1	1.4	1.1	1.4	0.0	0.0	0.0	0.0
Other locusts	13.3	0.3	0.5	0.9	3.7	1.3	1.2	1.6	2.6	1.2	0.0
Sassafras	30.9	4.9	3.8	5.8	2.4	3.0	3.2	1.9	0.6	4.0	1.2
Dogwood	15.5	13.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Holly	13.2	3.9	4.5	1.9	2.3	0.0	0.0	0.5	0.0	0.0	0.0
Other commercial	12.2	4.3	1.9	1.4	2.0	0.9	1.0	0.7	0.0	0.0	0.0
Total hardwoods	11,402.8	895.7	1,275.3	1,470.7	1,483.8	1,455.1	1,337.6	1,013.4	739.9	1,363.4	368.0
All species	20,611.1	1,759.9	2,512.5	2,737.8	2,855.3	2,775.6	2,504.0	1,762.0	1,250.8	2,031.9	421.2

Numbers in rows and columns may not sum to totals due to rounding.

[a] Includes white, swamp chestnut, chinkapin, and bur oaks.

[b] Includes cherrybark, northern red, and Shumard oaks.

Table 14—Volume of sawtimber on timberland by species and diameter class, Mississippi, 1994

Species	All classes	Diameter class (*inches at breast height*) 9.0–11.0	11.0–12.9	13.0–14.9	15.0–16.9	17.0–18.9	19.0–20.9	21.0–28.9	29.0 and larger
				Million board feet[a]					
Softwoods									
Longleaf pine	2,724.2	383.7	605.7	743.2	526.0	287.3	116.0	62.3	0.0
Slash pine	2,739.5	618.3	627.5	627.8	401.5	245.2	131.9	87.2	0.0
Shortleaf pine	6,815.1	1,377.9	1,795.2	1,429.2	1,216.2	511.7	267.2	213.4	4.3
Loblolly pine	24,969.4	3,027.5	3,959.3	4,411.3	4,435.3	3,161.8	2,374.4	3,401.9	197.8
Spruce pine	841.6	53.8	74.2	98.0	110.5	129.4	106.2	248.5	21.1
Redcedar	182.0	53.5	50.7	34.2	23.6	8.9	7.8	3.2	0.0
Hemlock-spruce	2.8	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0
Cypress	1,062.9	50.7	132.6	204.8	161.9	145.7	109.8	160.0	97.4
Total softwoods	39,337.7	5,565.5	7,245.2	7,548.6	6,877.8	4,490.1	3,113.3	4,176.6	320.6
Hardwoods									
Select white oaks[b]	3,574.9	0.0	512.7	655.1	633.4	584.7	380.3	750.9	57.9
Select red oaks[c]	3,131.5	0.0	265.4	375.2	427.8	494.9	353.1	923.9	291.2
Other white oaks	1,787.3	0.0	320.9	354.7	306.6	220.3	168.4	321.6	94.6
Other red oaks	9,826.6	0.0	1,321.9	1,635.3	1,662.3	1,257.5	1,106.8	2,127.5	715.3
Sweet pecan	335.3	0.0	23.4	34.9	40.9	32.3	24.5	108.2	71.1
Water hickory	384.0	0.0	40.4	47.6	50.6	94.1	46.0	95.0	10.3
Other hickories	2,154.3	0.0	428.7	455.5	468.3	304.4	244.7	248.1	4.6
Persimmon	58.5	0.0	29.3	3.3	8.9	10.2	6.7	0.0	0.0
Hard maples	38.4	0.0	10.1	8.7	2.1	10.7	3.3	3.7	0.0
Soft maples	248.7	0.0	87.1	80.9	41.9	15.1	11.0	10.5	2.2
Boxelder	147.6	0.0	34.1	51.7	27.4	21.2	9.9	3.3	0.0
Beech	561.8	0.0	30.8	52.8	82.0	118.5	62.0	177.1	38.7
Sweetgum	5,402.9	0.0	1,113.7	1,082.6	1,155.8	697.8	480.3	746.7	126.0
Blackgum	1,208.1	0.0	299.3	355.2	277.9	137.5	48.2	81.7	8.4
Other gums/tupelos	708.8	0.0	139.5	159.7	155.3	129.8	67.2	55.3	2.1
White ash	262.3	0.0	39.8	45.5	59.7	18.6	44.3	50.0	4.4
Other ashes	942.1	0.0	144.1	161.2	170.4	155.8	101.3	161.6	47.8
Sycamore	735.9	0.0	84.6	99.6	112.6	111.3	59.9	236.0	31.9
Cottonwood	597.3	0.0	7.3	19.2	28.0	23.4	49.5	189.6	280.3
Basswood	75.7	0.0	13.5	10.7	10.9	7.0	11.0	17.9	4.8
Yellow-poplar	2,363.6	0.0	275.4	388.6	390.7	394.0	297.0	516.1	101.8
Magnolia	151.3	0.0	18.0	20.6	22.6	30.7	22.4	34.4	2.6
Sweetbay	409.0	0.0	114.3	132.5	68.7	57.3	18.3	16.5	1.4
Willow	488.6	0.0	28.1	55.4	45.2	32.3	99.3	188.7	39.7
Black walnut	29.7	0.0	10.1	2.3	2.8	9.6	0.0	5.0	0.0
Black cherry	171.1	0.0	49.7	29.3	32.0	35.2	8.2	16.6	0.0
American elm	384.2	0.0	95.2	96.2	59.1	40.9	34.4	47.9	10.5
Other elms	419.6	0.0	100.3	117.2	72.6	46.0	28.4	55.1	0.0
River birch	119.2	0.0	20.9	21.0	40.0	18.2	6.6	12.6	0.0
Hackberry	955.2	0.0	172.2	208.8	179.5	137.0	115.5	136.1	6.0
Black locust	16.9	0.0	6.0	3.8	7.2	0.0	0.0	0.0	0.0
Other locusts	54.6	0.0	15.2	6.3	5.6	9.1	12.3	6.2	0.0
Sassafras	77.7	0.0	9.6	14.2	15.7	9.9	3.1	19.1	6.2
Holly	10.7	0.0	8.7	0.0	0.0	2.1	0.0	0.0	0.0
Other commercial	18.8	0.0	7.9	3.3	3.8	3.8	0.0	0.0	0.0
Total hardwoods	37,852.2	0.0	5,878.1	6,788.8	6,668.2	5,271.0	3,923.6	7,362.7	1,959.7
All species	77,189.9	5,565.5	13,123.3	14,337.4	13,546.0	9,761.2	7,036.9	11,539.3	2,280.3

Numbers in rows and columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

[b] Includes white, swamp chestnut, chinkapin, and bur oaks.

[c] Includes cherrybark, northern red, and Shumard oaks.

Table 15—Volume of sawtimber on timberland by species and tree grade, Mississippi, 1994

Species	All grades	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
			Million board feet[a]			
Softwoods						
Yellow pines	38,089.9	9,765.6	7,873.1	19,808.7	0.0	642.6
Cypress	1,062.9	396.8	232.9	387.8	0.0	45.4
Redcedar	182.0	170.7	0.0	0.0	0.0	11.4
Other softwoods	2.8	0.0	0.0	2.8	0.0	0.0
Total softwoods	39,337.7	10,333.1	8,106.0	20,199.3	0.0	699.3
Hardwoods						
Select white and red oaks[b]	6,706.4	1,839.8	1,761.9	2,112.8	605.3	386.5
Other white and red oaks	11,613.9	1,240.9	2,189.3	4,134.0	3,117.8	931.9
Hickories	2,873.6	371.8	648.7	1,354.1	335.0	164.0
Hard maples	38.4	6.2	7.7	12.3	10.2	1.9
Sweetgum	5,402.9	954.0	1,373.1	2,190.2	501.8	383.8
Tupelo and blackgum	1,916.9	277.4	610.8	877.5	54.2	97.1
Ash, walnut, and black cherry	1,405.2	432.3	347.1	484.8	58.7	82.4
Yellow-poplar	2,363.6	411.7	624.1	848.9	346.6	132.4
Other hardwoods	5,531.2	854.7	1,055.5	2,155.8	973.4	491.8
Total hardwoods	37,852.2	6,388.8	8,618.2	14,170.4	6,003.0	2,671.7
All species	77,189.9	16,721.9	16,724.2	34,369.7	6,003.0	3,371.0

Numbers in rows and columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

[b] Includes white, swamp chestnut, chinkapin, bur, cherrybark, northern red, and Shumard oaks.

Table 16—Average net annual growth and average annual removals of growing stock on timberland, by species, Mississippi, 1987 to 1994

Species	Average net annual growth	Average annual removals
	Million cubic feet	
Softwoods		
Yellow pines	632.1	708.8
Cypress	3.7	1.2
Redcedar	3.1	1.6
Total softwoods	639.0	711.6
Hardwoods		
Select white and red oaks[a]	85.1	80.1
Other white and red oaks	139.9	169.2
Hickories	21.5	23.6
Sweetgum	84.5	76.2
Tupelo and blackgum	21.4	19.6
Ash, walnut, and black cherry	20.0	9.7
Yellow-poplar	36.1	29.4
Other hardwoods	56.7	57.1
Total hardwoods	465.4	465.2
All species	1,104.4	1,176.8

Numbers in columns may not sum to totals due to rounding.

[a] Includes white, swamp chestnut, chinkapin, bur, cherrybark, northern red, and Shumard oaks.

Table 17—Average net annual growth and average annual removals of growing stock on timberland by ownership class and by softwoods and hardwoods, Mississippi, 1987 to 1994

Ownership class	Average net annual growth			Average annual removals		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Million cubic feet					
National forest	68.3	47.9	20.5	43.3	35.6	7.7
Other public	40.1	19.5	20.6	25.7	17.8	7.9
Forest industry	219.8	163.4	56.4	238.8	154.7	84.1
Nonindustrial private	776.1	408.2	367.9	869.0	503.6	365.4
All classes	1,104.4	639.0	465.4	1,176.8	711.6	465.2

Numbers in rows and columns may not sum to totals due to rounding.

Table 18—Average net annual growth and average annual removals of sawtimber on timberland by species, Mississippi, 1987 to 1994

Species	Average net annual growth	Average annual removals
	Million board feet[a]	
Softwoods		
Yellow pines	2,775.9	3,177.9
Cypress	17.3	3.6
Redcedar	8.3	4.2
Total softwoods	2,801.6	3,185.7
Hardwoods		
Select white and red oaks[b]	344.8	348.9
Other white and red oaks	589.1	659.3
Hickories	93.2	94.5
Hard maples	0.2	0.4
Sweetgum	271.0	210.7
Tupelo and blackgum	56.4	58.3
Ash, walnut, and black cherry	66.8	25.0
Yellow-poplar	166.8	135.4
Other hardwoods	186.5	193.4
Total hardwoods	1,774.8	1,725.8
All species	4,576.4	4,911.6

Numbers in columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

[b] Includes white, swamp chestnut, chinkapin, bur, cherrybark, northern red, and Shumard oaks.

Table 19—Average net annual growth and average annual removals of sawtimber on timberland by ownership class and by softwoods and hardwoods, Mississippi, 1987 to 1994

Ownership class	Average net annual growth			Average annual removals		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Million board feet[a]					
National forest	358.6	275.5	83.2	221.3	199.0	22.2
Other public	212.7	117.5	95.2	112.4	84.5	27.9
Forest industry	753.7	556.3	197.4	900.5	602.4	298.1
Nonindustrial private	3,251.3	1,852.3	1,399.0	3,677.5	2,299.8	1,377.7
All classes	4,576.4	2,801.6	1,774.8	4,911.6	3,185.7	1,725.8

Numbers in rows and columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

Table 20—Average annual mortality of growing stock and sawtimber on timberland by species, Mississippi, 1987 to 1994

Species	Average annual mortality	
	Growing stock	Sawtimber
	Million cubic feet	*Million board feet*[a]
Softwoods		
Yellow pines	73.0	271.4
Cypress	0.2	0.7
Redcedar	1.6	4.4
Total softwoods	74.8	276.5
Hardwoods		
Select white and red oaks[b]	6.6	22.4
Other white and red oaks	26.6	81.7
Hickories	7.4	28.2
Sweetgum	16.4	39.9
Tupelo and blackgum	3.5	9.8
Ash, walnut, and black cherry	4.0	6.7
Yellow-poplar	3.3	12.6
Other hardwoods	20.8	66.8
Total hardwoods	88.5	268.1
All species	163.3	544.7

Numbers in columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

[b] Includes white, swamp chestnut, chinkapin, bur, cherrybark, and Shumard oaks.

Table 21—Average annual mortality of growing stock and sawtimber on timberland by ownership class and by softwoods and hardwoods, Mississippi, 1987 to 1994

Ownership class	Average annual mortality					
	Growing stock			Sawtimber		
	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Million cubic feet			*Million board feet*[a]		
National forest	12.7	8.4	4.3	52.9	40.2	12.7
Other public	17.5	6.2	11.3	63.4	29.9	33.5
Forest industry	26.8	14.7	12.1	87.9	50.3	37.6
Nonindustrial private	106.4	45.5	60.9	340.5	156.1	184.4
All classes	163.3	74.8	88.5	544.7	276.5	268.1

Numbers in rows and columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

Table 22—Average annual mortality of growing stock and sawtimber on timberland by cause of death and by softwoods and hardwoods, Mississippi, 1987 to 1994

	Average annual mortality					
	Growing stock			Sawtimber		
Cause of death	All species	Softwood	Hardwood	All species	Softwood	Hardwood
	Million cubic feet			*Million board feet*[a]		
Bark beetles	22.4	22.4	0.0	88.2	88.2	0.0
Other insects	0.8	0.8	0.0	3.2	3.2	0.0
Disease	102.4	38.7	63.7	326.5	140.2	186.2
Fire	1.0	0.6	0.4	1.4	1.1	0.4
Beaver	5.2	0.6	4.6	16.6	2.9	13.7
Other animals	0.1	0.0	0.1	0.0	0.0	0.0
Weather	26.3	8.9	17.4	101.7	39.4	62.3
Suppression	4.0	2.6	1.4	4.0	1.2	2.9
Other	1.0	0.2	0.8	3.1	0.4	2.6
All causes	163.3	74.8	88.5	544.7	276.5	268.1

Numbers in rows and columns may not sum to totals due to rounding.

[a] International 1/4-inch rule.

Rosson, James F., Jr. 2001. Forest resources of Mississippi, 1994. Resour. Bull. SRS–61. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 78 p.

The principal findings of the seventh forest survey of Mississippi and changes that have occurred since the previous survey are presented. Topics examined include forest area, ownership, forest-type groups, stand structure, basal area, timber volume, growth, removals, mortality, harvesting, and management activity.

Keywords: Forest dynamics, forest inventory, forest plantations, forest productivity, forest survey, forest trends, large-scale sample, species distribution.

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